



**MICHIGAN DEPARTMENT OF TRANSPORTATION**

**State Long Range Transportation Plan  
2005-2030**

**Travel  
Characteristics  
Technical Report**

*Prepared by  
The Michigan Department  
of Transportation  
August 8, 2006*

*With assistance from*



**Wilbur Smith Associates**



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## Executive Summary

### *Purpose*

The *Travel Characteristics Technical Report* provides basic travel information for the general population using Michigan's transportation system, and ways in which the different components of the system seek to meet overall user requirements. It focuses on the travel behavior of Michigan residents.

### *Background, Data, and Methodology*

Data from the MI Travel Counts program undertaken by MDOT in 2004/2005 is the foundation of this travel characteristics analysis. The objective of the program was to obtain household travel information for input into the MDOT Statewide and Metropolitan Planning Organization (MPO) travel demand models.

To derive basic travel characteristics, aggregations of the MI Travel Counts dataset are needed regarding trip characteristics in relation to a trip-makers' personal and household characteristics. Similar activities are grouped into the same trip purpose, similar transportation types are grouped into common trip modes, individuals are grouped into age groups, and long distance trips are grouped into regions by their destinations. The total number of trips is summarized by these categories: sample area, personal characteristics, household characteristics, trip purpose, mode of transportation, and destinations.

### *Results*

Key results answer the four high-level questions: (1) who travels in Michigan, (2) why people travel in Michigan, (3) how people travel in Michigan, and (4) when people travel in Michigan. Special analysis also provides information regarding long distance trips and the implications of travel characteristics for the development of an integrated transportation system.

#### **Who Travels in Michigan**

- Households with more persons, workers, income, and vehicles generate more trips.
- Households in urban areas make more trips than households in rural areas.
- Workers make more trips than non-workers; however, non-workers (including persons under the age of 15) make 43 percent of Michigan's trips.
- Part-time workers make more trips on weekdays than full-time workers.
- Men make fewer but longer trips than women. Women age 36-64 have the highest trip rate.

#### **Why People Travel in Michigan**

- Work trips account for the largest share of Michigan's trips, followed by pick-up/drop-off/accompany trips.
- As a group, women ages 21-64 make more trips than men of the same age cohort for non-work purposes. In contrast, men ages 21-64 have a higher rate of work trips than



women of the same age cohort; women ages 21-64 make more than twice as many pick-up/drop-off/accompany trips as men of the same age cohort.

- The most frequent daily trip pattern for men is Home-Work-Home, while for women it is Home-Other-Home. "Other" includes pick-up/drop-off/accompany, which accounts for the largest percent of trip purposes for women.

### How People Travel in Michigan

- The predominant mode, by far, is use of the private automobile. School bus and walking are secondary modes.
- High occupancy vehicle trips account for 41 percent of Michigan's trips.
- The non-driving population and households without vehicles available still predominantly rely on private vehicles to access activities, but they tend to utilize walk and transit more than the driving population and households with autos available.
- Walk trips only account for four percent of the total trips and transit for one percent.
- Work trips have the lowest vehicle occupancy rate, while social/recreation trips have the highest.

### When People Travel in Michigan

- Friday is the busiest travel day in Michigan.
- Late summer is the time of the year in which most trips occur.
- Peak travel times are for trips departing between 7:00 and 9:00 a.m. and between 3:00 and 6:00 p.m.

### Long Distance Travel

- A large share of recreational long distance trips are within the state.
- Pleasure is the most common purpose for long distance trips.
- In rural areas, personal business accounts for a large share of long distance trips.
- Private vehicle is the primary mode used when traveling long distances.
- Air transportation accounts for a larger share of long distance business trips than for other purposes.

### Conclusion

Understanding travel characteristics is important for the integration of the *MI Transportation Plan*. Household and personal characteristics influence average trip rates, trip purpose, and trip durations. Households with more people, income, and autos produce more trips, while trip patterns and purposes are different according to age and gender. The segmentation of trip making into user groups including workers, students and young people, retirees (or soon-to-be retirees), women and families, non-driving populations, and recreational and long distance travelers provides a clearer understanding of the ultimate user objectives (in terms of personal activities) served by the system. These user segments offer important information to the *MI Transportation Plan*, and the role of travel characteristics for defining and addressing the meaning of system performance for economic vitality.

## Chapter 1. Introduction

This *Travel Characteristics Technical Report* is provided in support of the *MI Transportation Plan*. Reports supporting the plan provide reference material and information about users of Michigan's transportation system, and ways in which the different components of the system seek to meet overall user requirements. Together with the *Socioeconomics Technical Report* and the *Economic Outlook*, the *Travel Characteristics Technical Report* focuses on the demand side of transportation in Michigan. The findings of this report are integrated with the findings of other reports (the *Integration Technical Report*, the *Corridors and Borders Report*, the *Conditions and Performance Report*, and the *Gap and Investment Analysis*) to understand travel characteristics relative to highway, transit, non-motorized, inter-city, freight and other infrastructure, and service components of the system.

An integrated approach to transportation planning in Michigan requires understanding the state's current travel markets. The condition of the transportation system and its overall performance must be understood relative to system users' objectives. This report studies the state's transportation system users, their characteristics, and how and why they are using the system, providing context for other technical reports that examine how the system's modal components and other attributes perform to satisfy user objectives. This report complements the *Socioeconomics Technical Report* and *Economic Outlook* of the *MI Transportation Plan* in assessing the nature of demand for personal transportation in Michigan. Other important aspects of demand beyond the scope of personal or household travel characteristics are explored in the *Freight Technical Report*. The current report focuses primarily on personal travel, the critical user objectives, and activities facilitated by Michigan's transportation system.

Understanding personal travel characteristics requires addressing four essential questions about the use of Michigan's transportation system.

- Who travels in Michigan?
- Why do people travel in Michigan?
- How do people travel in Michigan?
- When do people travel in Michigan?

This document explores who, why, how, and when questions related to the travel characteristics Michigan. The "where" element of the travel characteristics will be explored in the *Corridors and Borders Report*. Additionally, throughout this report, statistics are reported by sub-regions of the State, which provides some level of where travel is happening or how travel varies by different parts of the state.

Because the answers to these questions may change over the 25-year period of the *MI Transportation Plan*, this report seeks to explore key relationships between user segments, activities, and modes that may affect the uses of the system in the long term.



## Chapter 2. Approach and Procedures

This report explores travel characteristics in Michigan through the use of *descriptive* statistical methods, characterizing travel based on user attributes and objectives. Data from the MI Travel Counts program described below is used to answer the four questions outlined in **Chapter 1**, and to illustrate important characteristics of Michigan's traveling public.

### 2.1 Data

Data from the MI Travel Counts program undertaken by MDOT in 2004/2005 is the foundation of the travel characteristics analysis. The objective of the program was to obtain household travel information statewide for input into the MDOT Statewide and Metropolitan Planning Organization (MPO) travel demand models.

Basic demographics and 48 hours of weekday travel information including destination, mode of travel, and trip purpose were collected for every member (including children) of over 14,280 households. Michigan was divided into seven geographic areas, collecting travel information from a minimum of 2,040 households per sample area. The seven geographic sample areas as shown in **Figure 1** are:

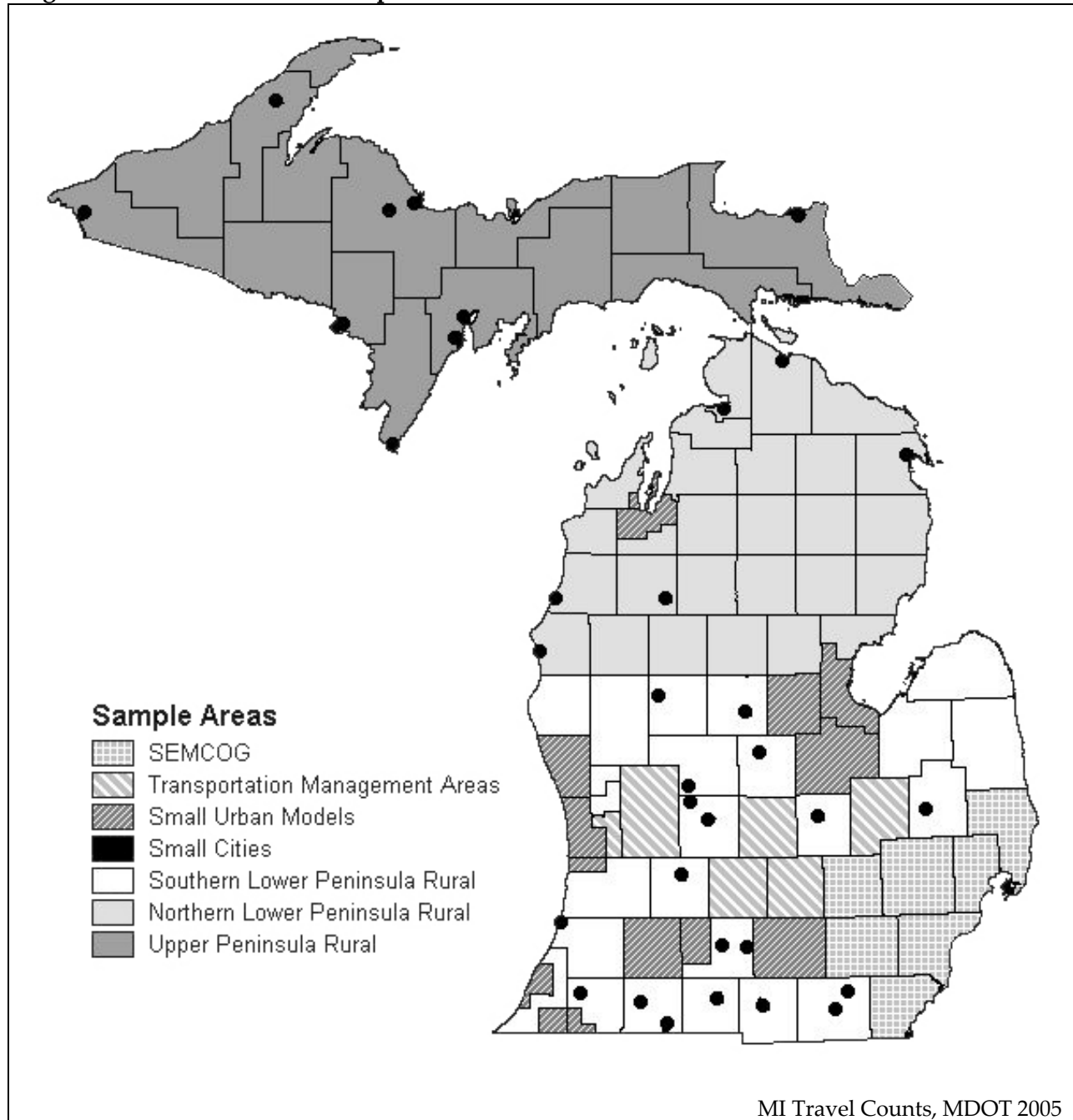
1. Southeast Michigan Council Of Governments (SEMCOG) (Seven counties of the Detroit Area)
2. Transportation Management Areas (TMAs) (Urban area population over 200,000 - Grand Rapids, Flint, and Lansing)
3. Small Urban Modeled Areas (Urban area population between 50,000 and 200,000)
4. Small Cities (Population of 5,000-50,000 outside small urban and TMA areas)
5. Southern Lower Peninsula Rural
6. Northern Lower Peninsula Rural
7. Upper Peninsula Rural

To ensure a statistically representative sample of each area, the number of households sampled by household size, workers, and vehicles available was determined from the distribution of households reported in the 2000 Public-Use Microdata Samples (PUMS) from the Census. To derive the overall state characteristics, the data was weighted by the number of households in each area according to the 2005 projections contained in the *Socioeconomics Technical Report*. The MI Travel Counts information reflects the base year of the *MI Transportation Plan*. The assumption was that the distribution of households in the Census 2000 PUMS data had not changed significantly from 2000 to 2005 and is still valid.

In addition to the MI Travel Counts data, MDOT Permanent Traffic Recorder (PTR) data was used to provide monthly and weekly traffic patterns on the state trunkline roads. Tourism-related employment, second homes, and visitor person day data used in analysis of seasonal traffic pattern locations were obtained from the US Bureau of Economic Analysis, US Census,

and Michigan State University Extension. The PTR data used is explained in greater detail in Section 3.4.1 .

**Figure 1. MI Travel Counts Sample Areas**



## 2.2 Methodology and Procedures

### 2.2.1 Definitions

The following list provides definitions for technical terms used in this report:

*Activity Pattern.* A chronological listing of the activity locations for one person over a 24-hour period.

*Auto Occupancy.* The number of persons in a vehicle, including the driver.

*Average Daily Traffic (ADT).* The average of a series of traffic counts in a particular period of time.

*Annual Average Daily Traffic (AADT).* The average traffic count based on daily traffic count data collected continuously throughout the year.

*High occupancy vehicle trip.* A trip made by a privately operated vehicle with more than one occupant.

*Daily Trip.* A trip going from one location to another on an average weekday (Monday-Thursday). A single trip may use more than one mode of transportation.

*Daily Trips.* The total number of trips made by a person or household in a 24-hour period.

*Delay.* The time a (person or) vehicle is standing still or moving forward in a queue. It is the extra time occurred by moving at congested speed (slower than posted speed due to the volume of traffic).

*Discretionary Trip.* A trip for an activity that can be easily forgone if the traveler opts not to spend his or her time or money on the trip or activity.

*Essential Trip.* A trip for an activity that cannot be easily forgone, but that is required for health and sustenance of the individual or household.

*Friday ADT.* The average traffic count for Fridays in a particular month.

*Household Characteristics.* The household characteristics related to travel that were analyzed include household income, household size, the number of autos available, and the number of workers in the household.

*Long Distance Trip.* A trip of more than 100 miles away from home taken during the three months prior to the survey.

*Mode of Transportation.* The types of transportation used to make a trip include school bus, walk, bike, public transit, and private vehicle.

*Monthly Average Daily Traffic (MADT).* The average traffic count for a particular month.

*Percentage of Visitor Person Days.* The proportion of visitor person days in relation to total person days. A person day is equivalent to one person spending one day in a given area. Total person days include both permanent resident days and visitor person days. The amount of permanent resident days is computed by multiplying the local population by 365.

*Person Characteristics.* The person characteristics related to travel that were analyzed include age, gender, licensed or non-licensed driver, and working status.

*Person Trip.* A trip made by one person by any mode for any purpose.

*Saturday ADT.* The average traffic count for Saturdays in a particular month.

*Sunday ADT.* The average traffic count for Sundays in a particular month.

*Time Spent Traveling.* The total amount of time a person or a household spent traveling during a 24-hour period. The sum of the trip duration for all trips.

*Travel Characteristics.* Any properties, measurements, or factors that describe and influence travel patterns for a group of people or in a particular area. Travel characteristics examine trip characteristics, trip makers' personal and household characteristics, and the relationship between the trip maker and the trip and utilization of the system.

*Travel Time Period.* The hour of the day when a trip starts.

*Trip Chain.* A series of trips linked together between anchor destinations, such as a trip that leaves home, stops to drop off a passenger, stops for coffee, and continues to work.

*Trip Characteristics.* The trip characteristics related to travel that were analyzed include purpose, mode, duration, time period, and amount.

*Trip Duration.* The time (in minutes) between the departure and arrival times of a trip.

*Trip Purpose.* The reason for travel, or the main activity at the trip destination.

*User Segments.* Groups of people who use the transportation system in a similar way, with similar travel characteristics and purposes.

*Vehicle Trip.* A trip made by a privately operated vehicle regardless of the number of persons in the vehicle.

*Weekday ADT.* The average traffic count for weekdays in a particular month.

*Zero-Auto Household.* A household that has no automobiles available for use.

### 2.2.2 Grouping

The MI Travel Counts data are extensive and were collected in the form of a detailed personal travel diary. To derive basic travel characteristics, aggregations were needed regarding trip characteristics in relation to a trip-maker's personal and household characteristics.

Items in this report were grouped according to the following standards:

- Similar activities were grouped into the same trip purpose, similar transportation types were grouped into common trip modes, individuals were grouped into age groups, and long distance trips were grouped into regions by their destinations.
- Daily trip purposes include work, school/childcare, religious/community, personal business, social/recreation, shopping, and pick-up/drop-off/accompany.

- Daily travel modes include private vehicle, public transit, bike, walk, school bus, and other. Public transit includes fixed-route public bus and Dial-a-Ride services.
- Long distance trip purposes include business, pleasure, personal business, school/church, and other.
- Long distance trip travel modes include private vehicle, airplane, bus, train, and other.
- Long distance trip destinations include Michigan (Southern Lower Peninsula, Northern Lower Peninsula, Upper Peninsula), Great Lakes states (Ohio, Indiana, Illinois, Wisconsin, Minnesota), remainder of US (Florida, Northeastern US, Southeastern US, Central US, Western US), and other (Canada/Alaska, any other location not listed above).
- Age groups include 0-15, 16-20, 21-35, 36-64, 65 and over.

### 2.2.3 Linking Trip Characteristics with Household and Personal Characteristics

Each trip serves a purpose, requires a mode, and has a destination. Travel is derived from the spatial separation of activities and is influenced by a person's economic means and the transportation choices available. Collectively, generalized travel patterns represent the travel characteristics for economic groups or geographic areas.

### 2.2.4 Summarization and Aggregation

After joining trip records to personal and household characteristics, the total number of trips was summarized by these categories: sample area, personal characteristics, household characteristics, trip purpose, mode of transportation, and destinations shown in **Table 1**.

**Table 1. Data Totals (Two-Day Total)**

<i>Sample Area</i>	<i>Households</i>	<i>Persons</i>	<i>Trips</i>	<i>Trips per Household</i>	<i>Trips per Person</i>
SEMCOG	2,221	5,577	38,090	17.1	6.8
TMA's	2,065	5,284	38,453	18.6	7.3
Small Urban	2,045	5,060	36,459	17.8	7.2
Small Cities	2,328	5,835	43,453	18.7	7.4
Southern Lower Peninsula Rural	2,059	5,236	35,153	17.1	6.7
Northern Lower Peninsula Rural	2,073	5,077	32,147	15.5	6.3
Upper Peninsula Rural	2,027	4,853	32,418	16.0	6.7
<i>Total</i>	14,818	36,922	256,173	17.3	6.9

*MI Travel Counts, MDOT 2005*

### 2.2.5 Averaging

After obtaining the total numbers of trips by category, they were averaged to remove the effects of sample sizes so the results are comparable. The variables used to average include the total number of persons, the number of households for a particular group, and the number of travel days during the survey. All daily trip rates are a result of averaging.

### 2.2.6 Percentage Distribution

The average trip rates indicate the amount of travel. The distribution of travel among groups of people, the different purposes, and the different modes of transportation are other important aspects of travel characteristics. The percentage of trip distribution for a category is obtained by computing the total group's trips in relation to the total number of trips. As a result, comparisons are possible among genders, age groups, purposes, modes, and destinations.

### 2.2.7 Estimation of Statewide Averages

The MI Travel Counts program was designed to sample about 2,040 households in each sampling area, stratified by household size, vehicles available, and the number of workers in the household. However, households in Michigan are not evenly distributed among the seven sampling areas. Therefore, to estimate the statewide average travel characteristics, a weight was computed for each sampling area based on the area's proportion of households relative to the total number of households in the state. This weight, shown in **Table 2**, was applied to each area's individual measurements to derive an estimate of the statewide average for the same travel characteristics.

**Table 2. Weighting for Each Sampling Area**

<i>Sampling Area</i>	<i>Number of 2005 Households</i>	<i>Weight</i>
SEMCOG	1,988,548	0.495776
TMA's	608,258	0.151648
Small Urban Models	563,669	0.140532
Small Cities	133,605	0.033310
SLP Rural	412,133	0.102751
NLP Rural	217,903	0.054327
UP Rural	86,863	0.021656
<i>Statewide Total</i>	<i>4,010,979</i>	<i>1.000000</i>

MDOT Statewide Model Unit, 2005

### 2.2.8 Time of Travel

Measures of when people travel by month of year and day of week were derived from MDOT Permanent Traffic Recorder (PTR) data. PTR stations throughout the state are used to



determine these monthly and weekly travel patterns. The average hourly travel was computed by using the start time and end time of the trips from the MI Travel Counts data.

### 2.2.9 Analysis

Qualitative analyses were used to explore relationships between groups' travel characteristics at a highly aggregated level. Quantitative analyses were performed to provide more definitive explanations, so that the qualitative analytical results can be confirmed and used for policy making.

The objective of these statistical analyses was to provide sound results regarding travel characteristics and to gain a better understanding of the behaviors and decision-making processes at the personal and household level. Since person characteristics related to travel are categorical (such as age, gender, and person with or without a driver's license), analyses at the personal level confirm qualitative results by comparing the group means and variances of these travel characteristics.

Household characteristics related to travel include the number of persons in the household, number of workers in the household, number of autos available, and household income. After assessing the relationships of these household characteristics using standard correlation coefficient analysis, simple and multivariable regression analyses determined their explanatory potential in relation to household trip making and mode utilization. The results presented in tables and graphs are weighted group and area averages for the purpose of discussion.

## Chapter 3. Findings

The travel characteristics of the population in Michigan are analyzed and presented in this chapter.

### 3.1 Who Travels in Michigan

This section describes the nature of Michigan's transportation system users. Understanding system users is important for understanding how user objectives are experienced on the system, and how the requirements and demands for the system may change over time in light of socioeconomic change. While specific travel patterns may vary by mode, region, and community, this section provides an overall view of who the system users are, where they are, and the socioeconomic factors that influence their use of Michigan's transportation system.

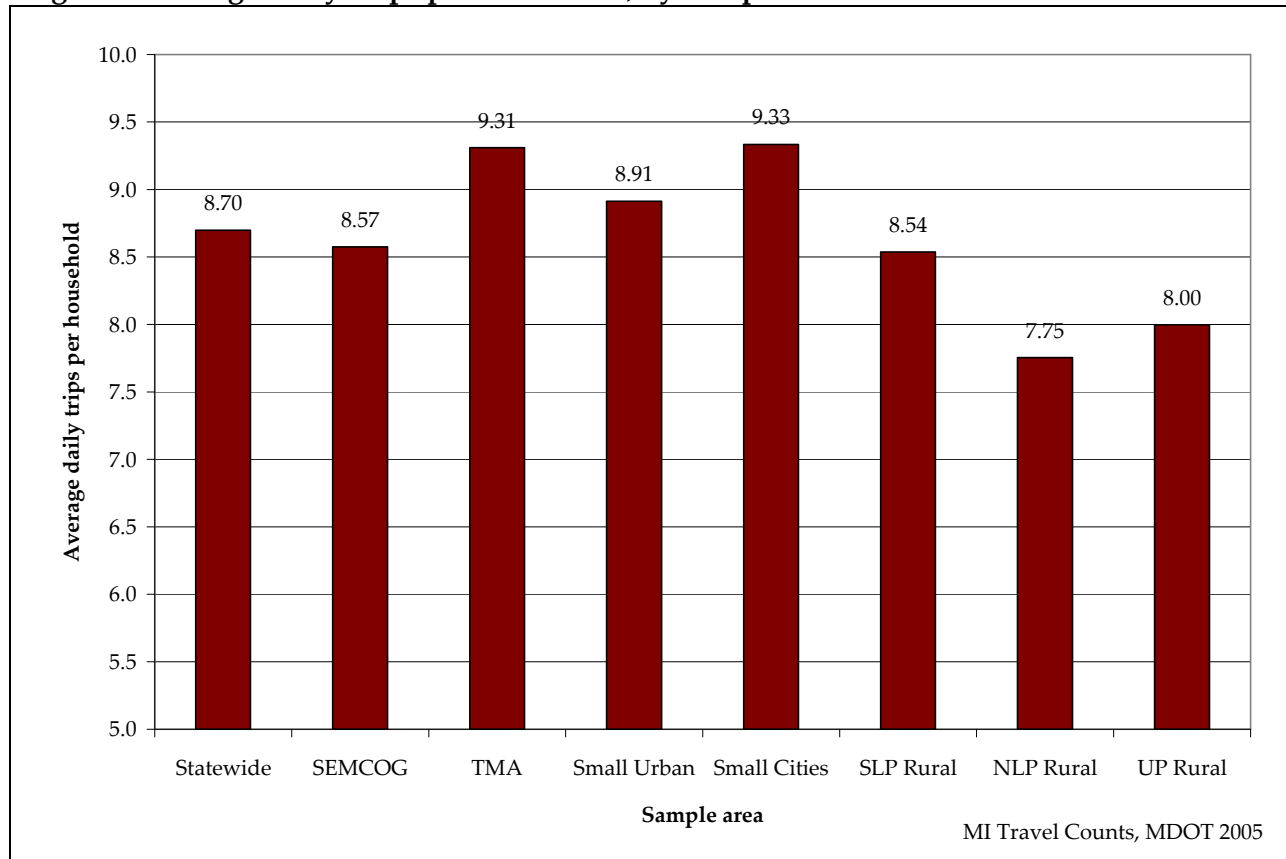
#### 3.1.1 Trips by Person and Household Characteristics

An important construct for understanding travel characteristics is the linkage between travel and activities. Because travel is secondary in nature, undertaken to support ultimate activities at the trip destination, activity patterns dictate personal and household trips. These activity patterns are often implicit in personal and household travel patterns. Activities (work, school, shopping, and so on) are important for the *MI Transportation Plan* because they create value in the state's economy and represent participation by Michigan's public in both the workforce and consumer markets. Personal and household characteristics offer insight into who is using Michigan's transportation system, where, and to what extent. These characteristics provide a broad view of system use and transportation objectives based on today's travel behavior. This section examines how trips are generated by individuals and households throughout the state.

Because urban areas and small towns have higher density and offer more activities within close proximity to one another, the time, distance, and cost associated with making a trip to participate in an activity are, on average, less than they would be in a rural area. Consequently, travelers in urban areas may participate in more activities and make more trips than travelers in less densely populated areas.

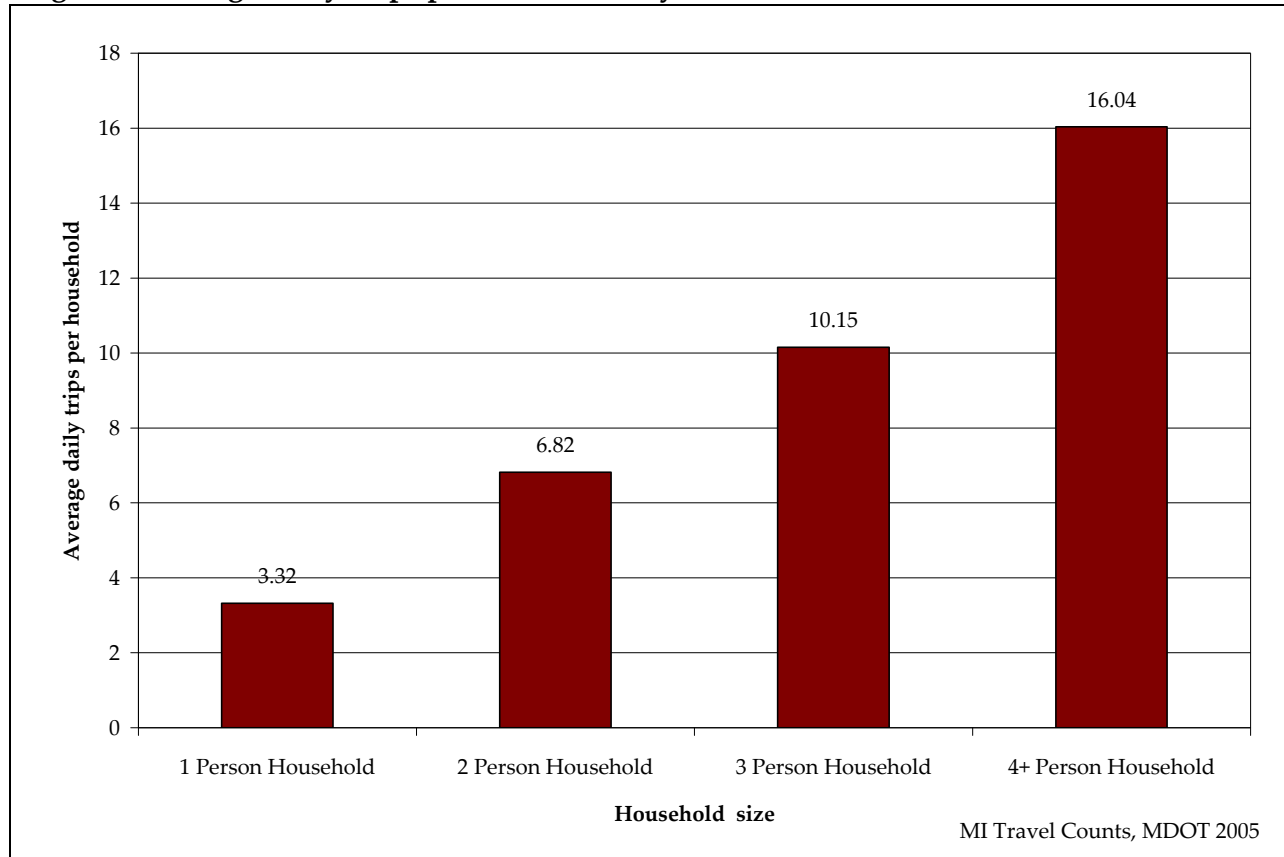
**Figure 2** demonstrates that, on average, household trip rates are lower in rural areas than elsewhere in the state. It also shows that household trip rates are higher in small cities, small urban areas, and Transportation Management Areas, where density supports more trips, but where there may be fewer constraints associated with large scale urban congestion, parking expenses, and other complexities of urban traffic.

**Figure 2. Average Daily Trips per Household, by Sample Area**



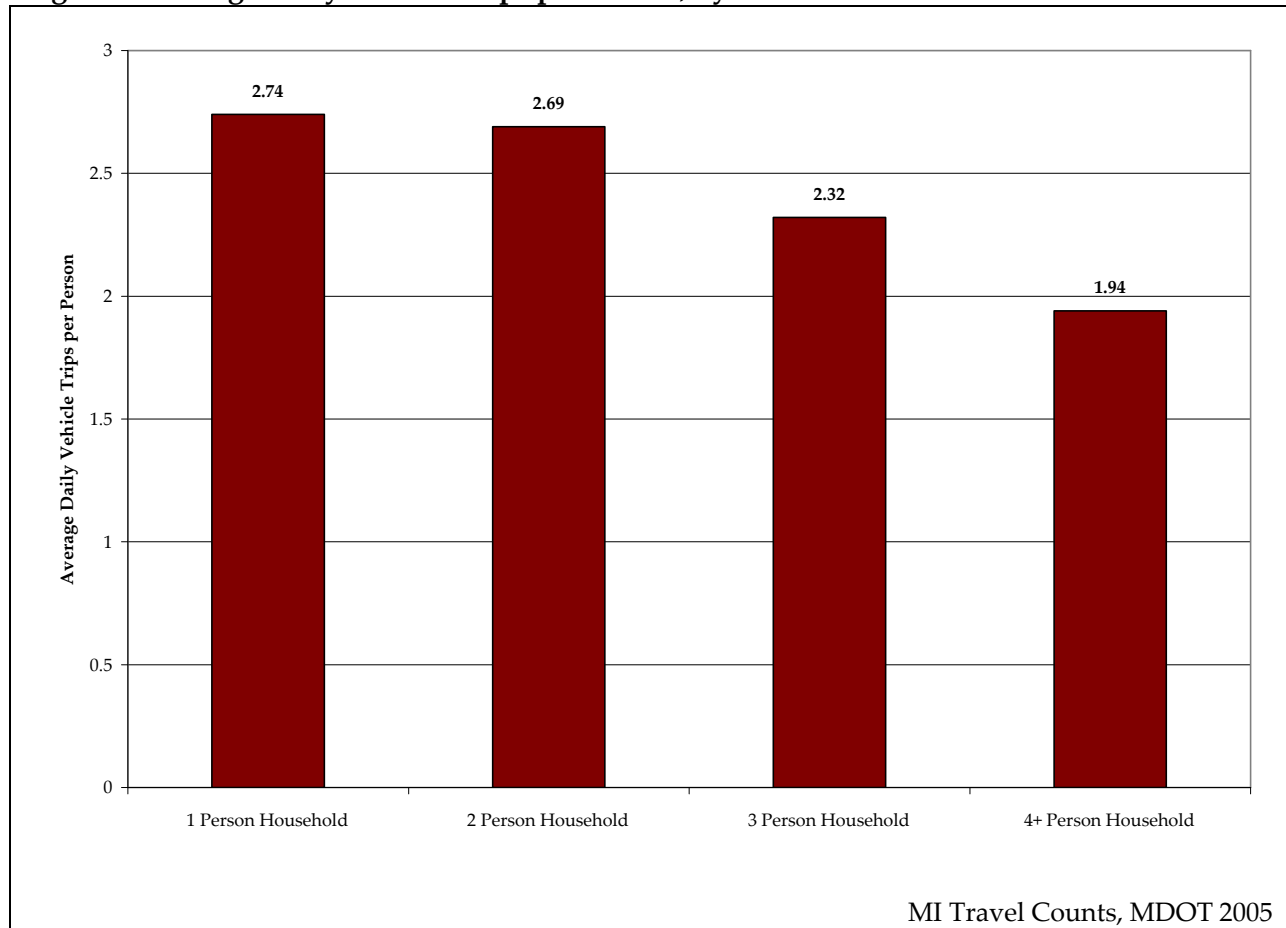
The demand for travel is also sensitive to the number of persons in a household. On average, larger households generate more trips simply because they have more people participating in activities. **Figure 3** illustrates that household trip rates increase by roughly three (3) trips for each additional person.

**Figure 3. Average Daily Trips per Household, by Household Size**



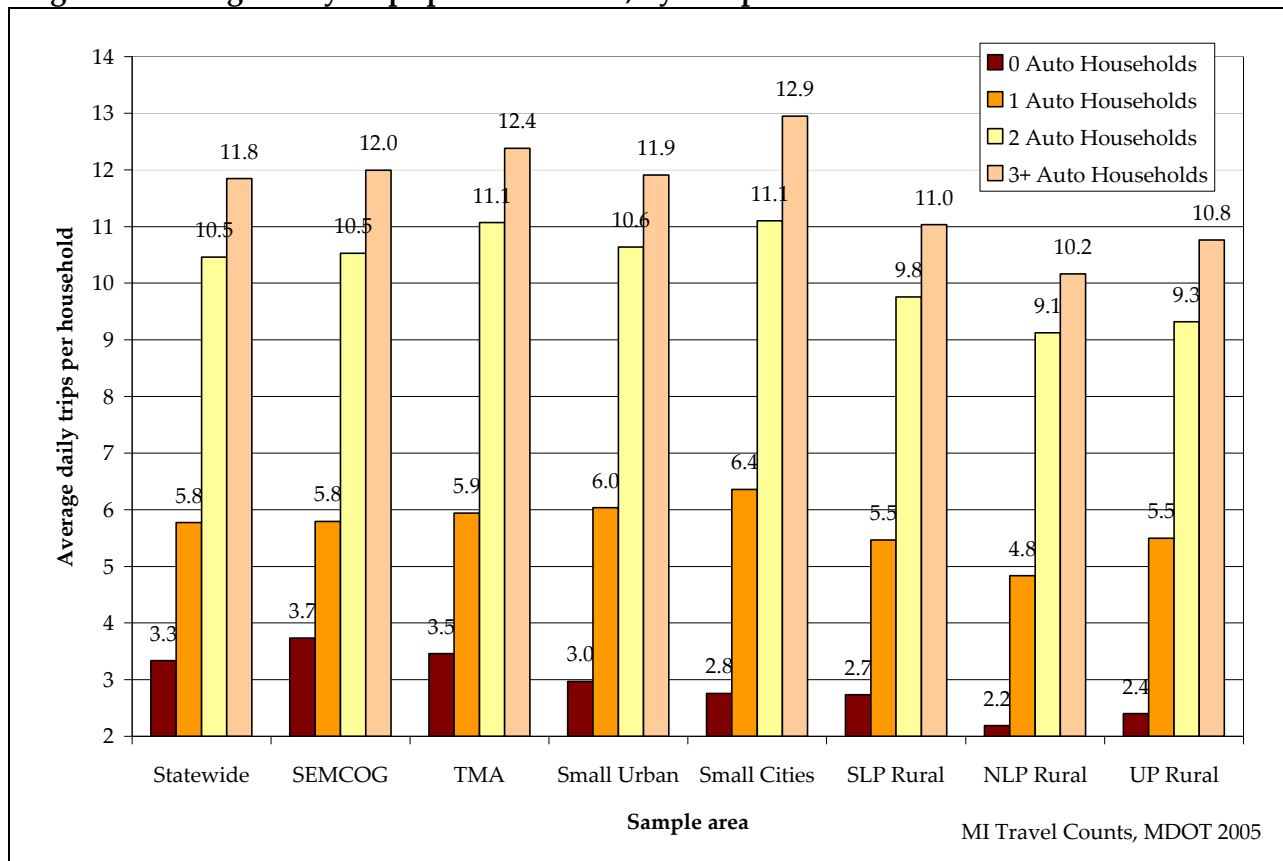
**Figure 4** suggests that travelers in larger households may share household vehicles, generating fewer vehicle trips per person, especially when households have three or more people (often representing a child in the household). Smaller households also may make more vehicle trips per person because there are fewer people to share the basic household duties such as grocery shopping.

**Figure 4. Average Daily Vehicle Trips per Person, by Household Size**



As mentioned earlier, the demand for travel is sensitive to the number of persons in a household. This demand for travel is facilitated through the transportation means available to the household. The most common means of travel is the private vehicle. Travelers in households with more vehicles available are less constrained regarding when they may travel and to what destinations. Furthermore, auto availability is associated with income (higher-income households can afford both more activities involving travel and more automobiles). As illustrated in **Figure 5**, households with more automobiles available generate more overall daily trips than households with fewer vehicles available. This is consistent for each of the seven sample areas.

**Figure 5. Average Daily Trips per Household, by Sample Area and Vehicles Available**

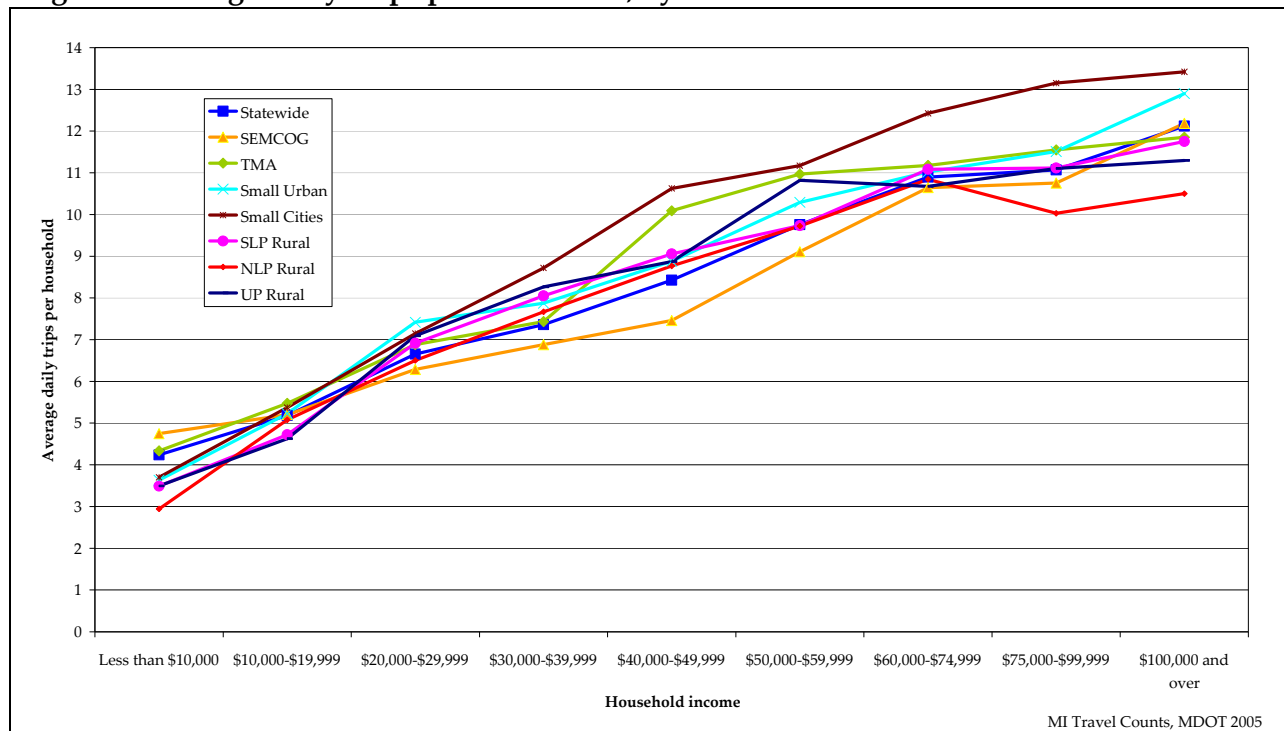




The above finding regarding auto availability and trip making can also be explained by household income. Higher-income households represent important segments of consumer markets in Michigan, since members of these households can afford to engage in more activities, and have automobiles available to support travel to these activities. Furthermore, because insurance, gasoline, and other travel expenses represent a smaller share of household expenditures as income increases, higher-income households are expected to have fewer economic trade-offs associated with making more trips to participate in activities. **Figure 6** demonstrates that household income is an important factor of trip making in Michigan.

This dynamic is consistent throughout the state, with trip rates leveling off at about 11 trips per day. At this point trips are found to reach a saturation point, where there are diminishing returns on increasing activities or trips, regardless of income.

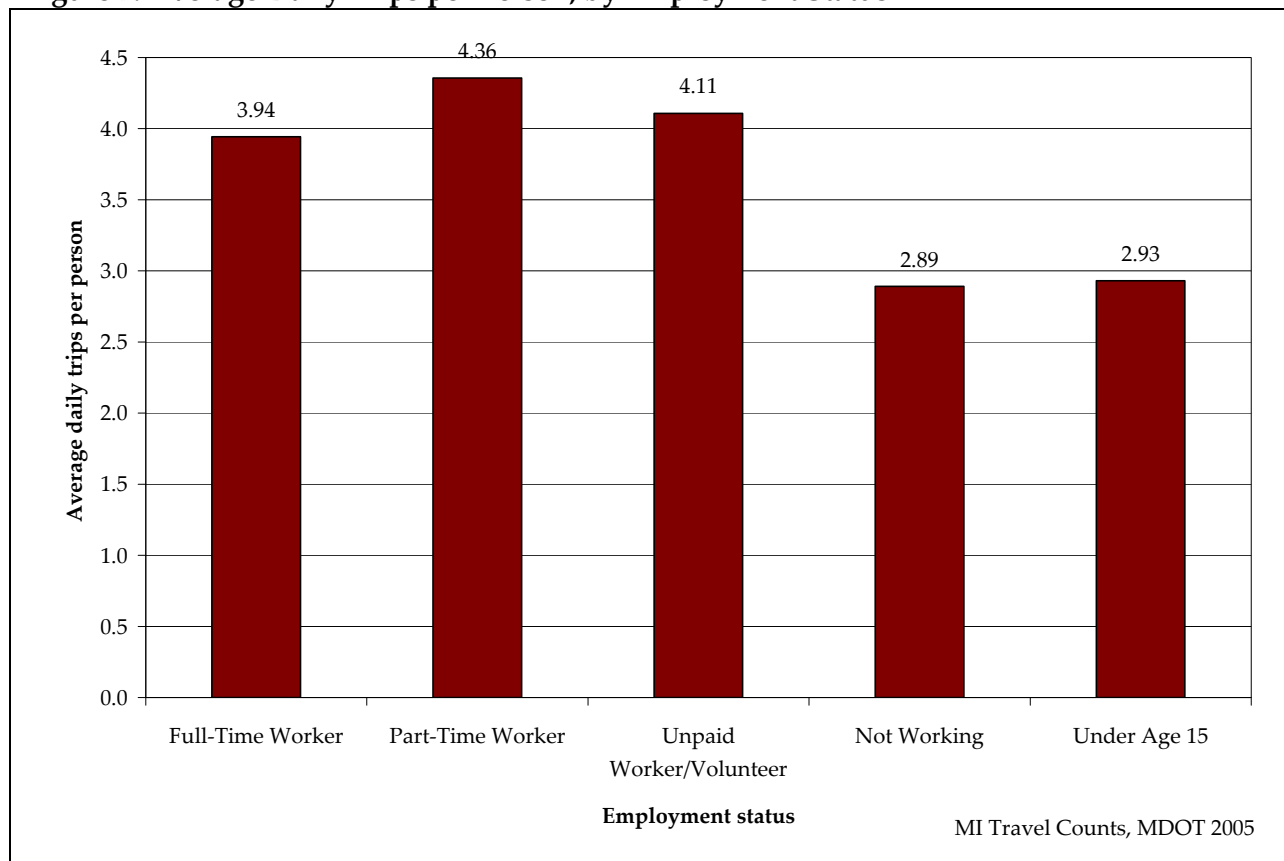
**Figure 6. Average Daily Trips per Household, by Household Income**



The finding regarding income could be interpreted as an indication of discretionary trip making or trip making associated with non-essential activities afforded by higher income. However, for most travelers, trip making represents a more fundamental need. This essential trip making meets the most basic purposes of health and sustenance and participating in Michigan's workforce.

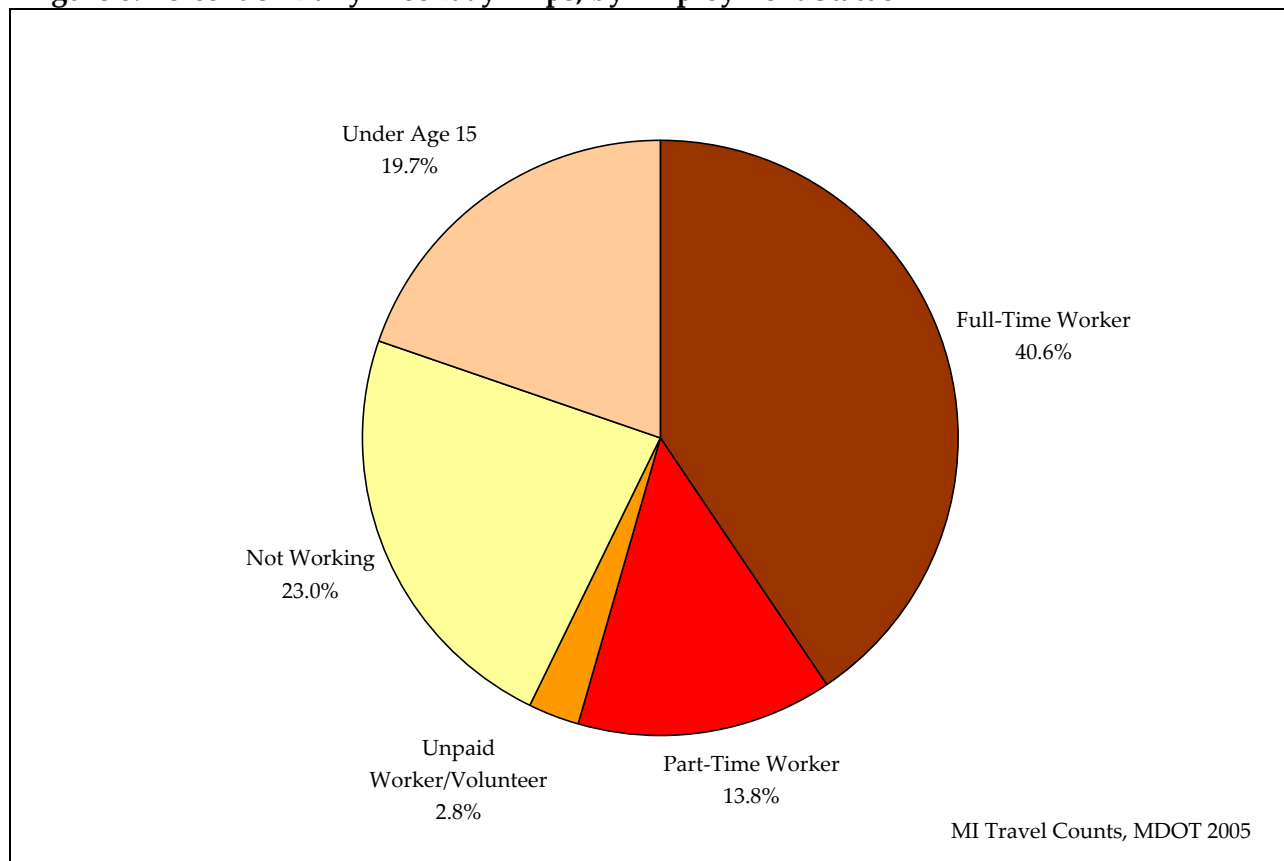
**Figure 7** shows that travelers who are in the workforce travel significantly more than children or unemployed adults. Part-time workers are found to make more trips than full-time workers, representing a higher number of activities for part-time workers on any given weekday. This is intuitive, given that part-time workers earn income to support travel and other activities, but also have more time than full-time workers to allocate to these activities and resulting trips. It is also possible that part-time workers may work in multiple jobs at different locations, accounting for more than one daily journey to work. This finding regarding part-time workers is important because issues such as phased retirement may increase the number of part-time workers in Michigan's labor market in the future, and as a result, would impact transportation system.

**Figure 7. Average Daily Trips per Person, by Employment Status**



While part-time workers and volunteers have the highest trip rates, they represent a smaller segment of Michigan's traveling population and generate a smaller share of weekday trips, at about 16.5 percent. **Figure 8** documents the share of daily weekday trips per person by employment status. With lower trip rates, but comprising a larger share of the population, those not working and children under the age of 15 represent larger shares of overall daily weekday trips than part-time workers, accounting collectively for 42.7 percent of daily weekday trips. This distribution may change in the future, depending on trends in phased retirement and the workforce participation by persons age 65 and older.

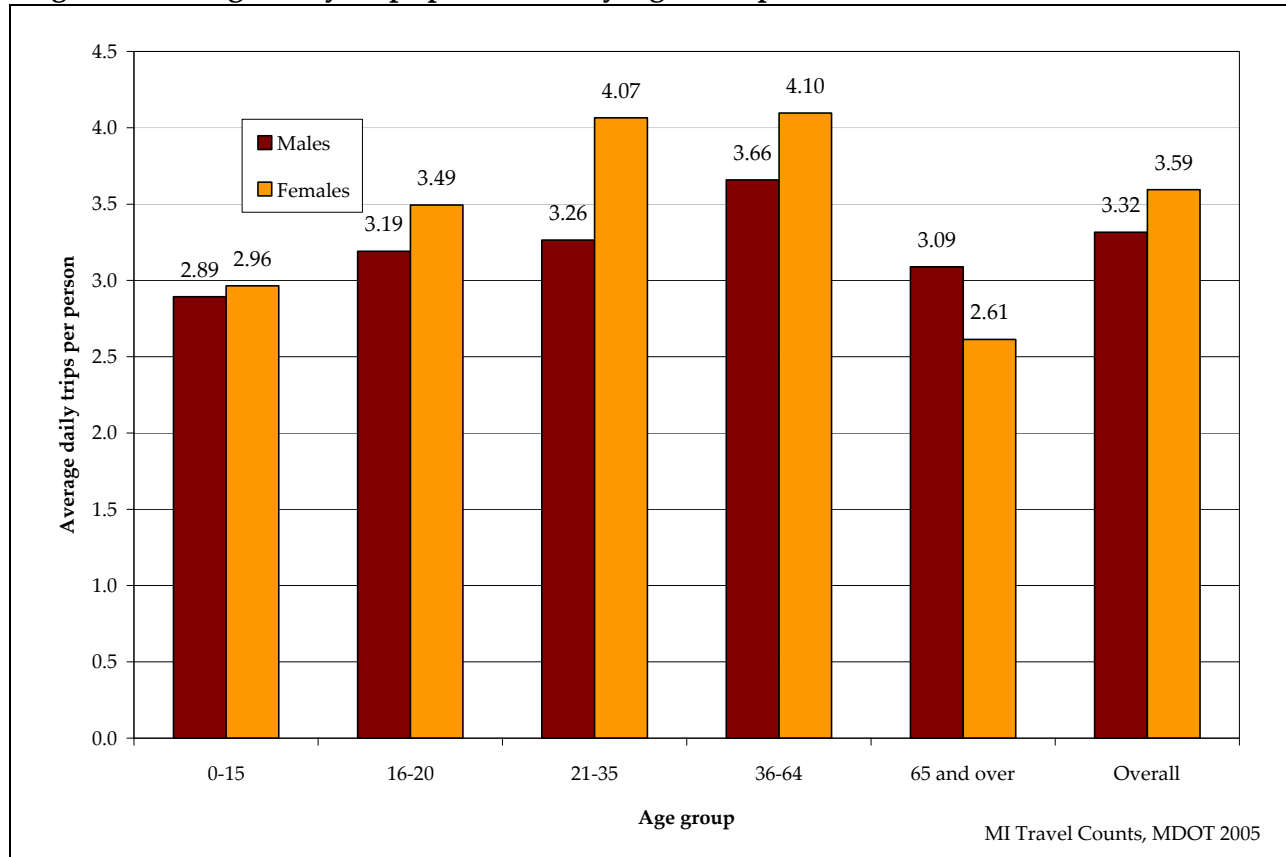
**Figure 8. Percent of Daily Weekday Trips, by Employment Status**



As mentioned above, travel patterns may be increasingly influenced by an aging population. Members of older age cohorts will have an impact both as potential part-time workers and as participants in consumer markets. **Figure 9** illustrates how trip making varies by age today. The figure illustrates how not only retirement, but also other life cycle trends affect trip making. For example, for teenagers and children under the age of 15, both genders have relatively similar levels of trip making. The difference in trips between men and women increases as they enter the years when work, parenting, and family activities become part of the life cycle (21-35), with women making significantly more trips than men. This gap begins to close as adults mature (ages 36-64) and their children begin coming of age.

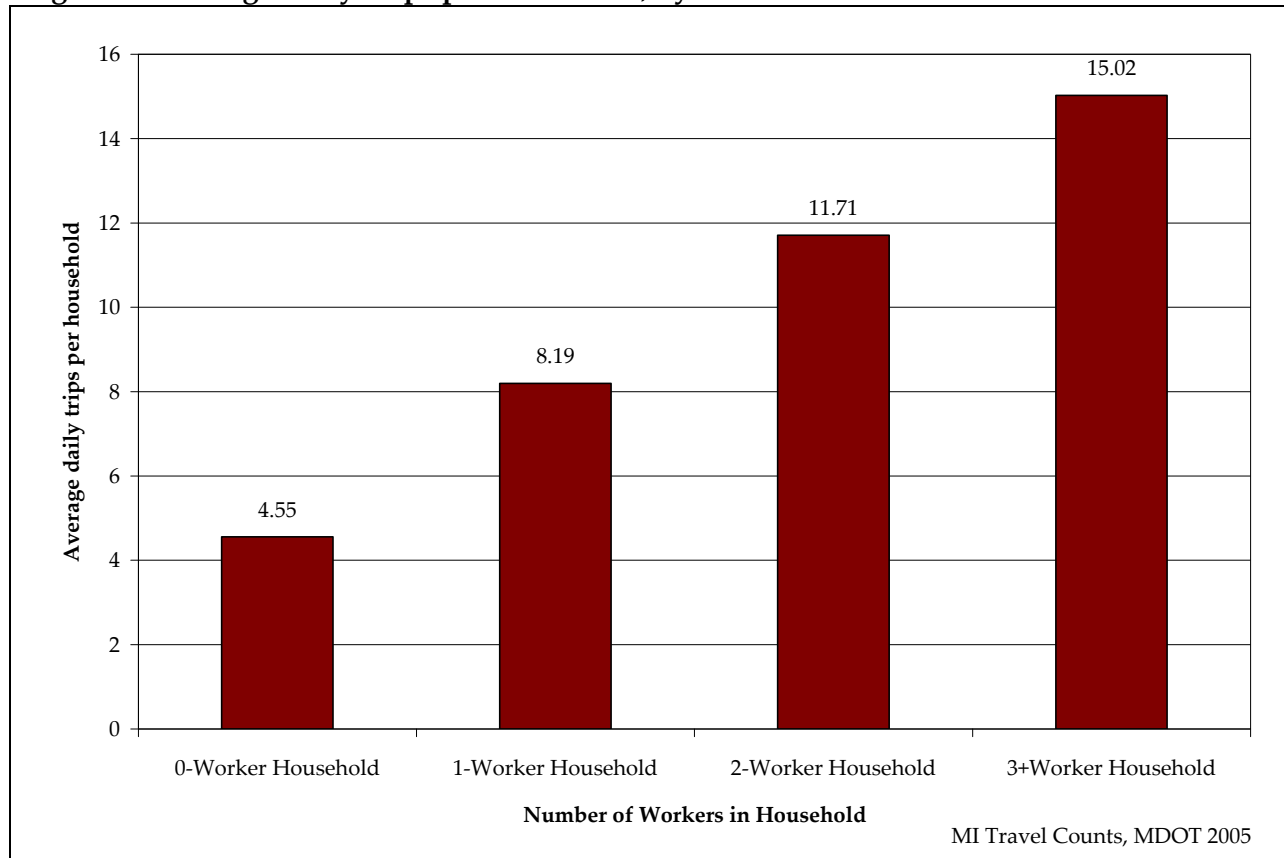
After age 65, trip making decreases, significantly more so for women than for men. This may be due to women in this age group being less likely than men to participate in the workforce. Women also live longer than men on average, and mobility decreases with age. In addition, those living in retirement homes or with adult children may have less of a need to travel.

**Figure 9. Average Daily Trips per Person, by Age Group and Gender**



The above discussion and **Figure 9** point to the significance of both life cycle and workforce participation as factors of trip making: trips increase as people enter the workforce and decrease as individuals enter retirement years. **Figure 10** clarifies the relationship between workforce participation and trip making, demonstrating how overall trip making increases as the number of workers in the household increases. Because the number of workers per household is a proxy for many of the variables that influence trip making (household size, earnings, and auto availability all tend to be higher in households with more workers), **Figure 10** is indicative of several factors associated with trip making that have been addressed in this section.

**Figure 10. Average Daily Trips per Household, by Number of Workers in Household**



### 3.1.2 Travel Duration by Person and Household Characteristics

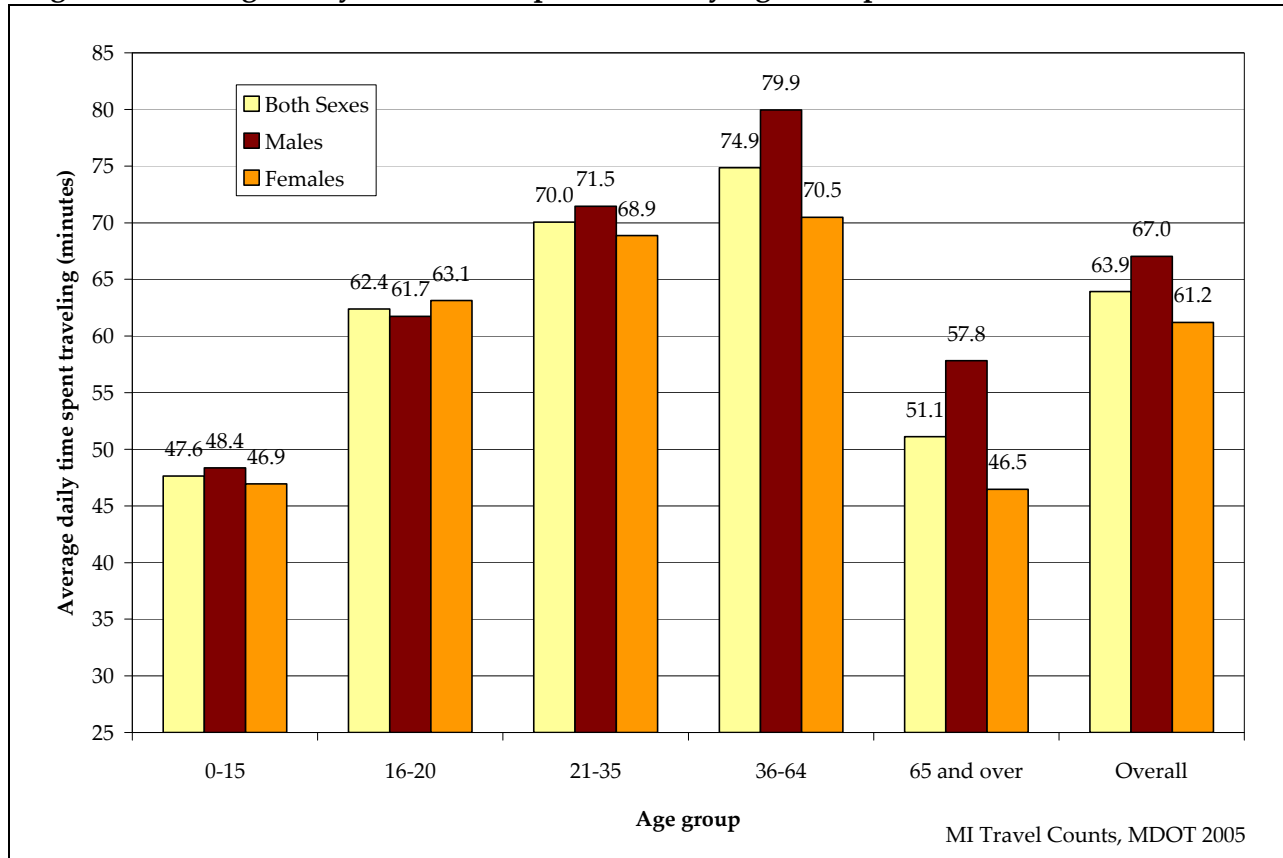
**Section 3.1.1** explored how individual and household characteristics influence trip making. To better understand these findings, it is necessary to also examine the trips in detail. The amount of travel per person or household is not only measured by the number of trips, but also by the length of the trip in either distance or time. Trip duration is the amount of time spent traveling, while trip length is the distance traversed in making the trip. Examination of travel duration lends greater insight into how the trip making patterns described above account for the traveling public and miles traveled on Michigan's transportation system. Trip duration provides an indication of how much time and money is associated with trip making at the expense of other activities that might generate value in Michigan's economy. This is not only a

measure of the efficiency of the transportation system, but also an indicator of convenience, accessibility, and quality of life for Michigan's travelers.

**Section 3.1.1** included the finding that people in small cities make more trips than those in larger cities. If the time required to make a trip in a small city is less, then time is available for more activities, which results in more trips. This is important because more time spent in activities often means more time for both work and family life, which are important for Michigan's economy and residents. As compared to other areas, the trips in these smaller cities are typically much shorter trips in distance, thus explaining the lower travel time duration.

**Figure 11** shows the variations in daily travel duration by age and gender. Males have longer daily travel times than females, except for the 16 to 20 age group. The gender difference is most pronounced in the 65 and over age group.

**Figure 11. Average Daily Travel Time per Person, by Age Group and Gender**



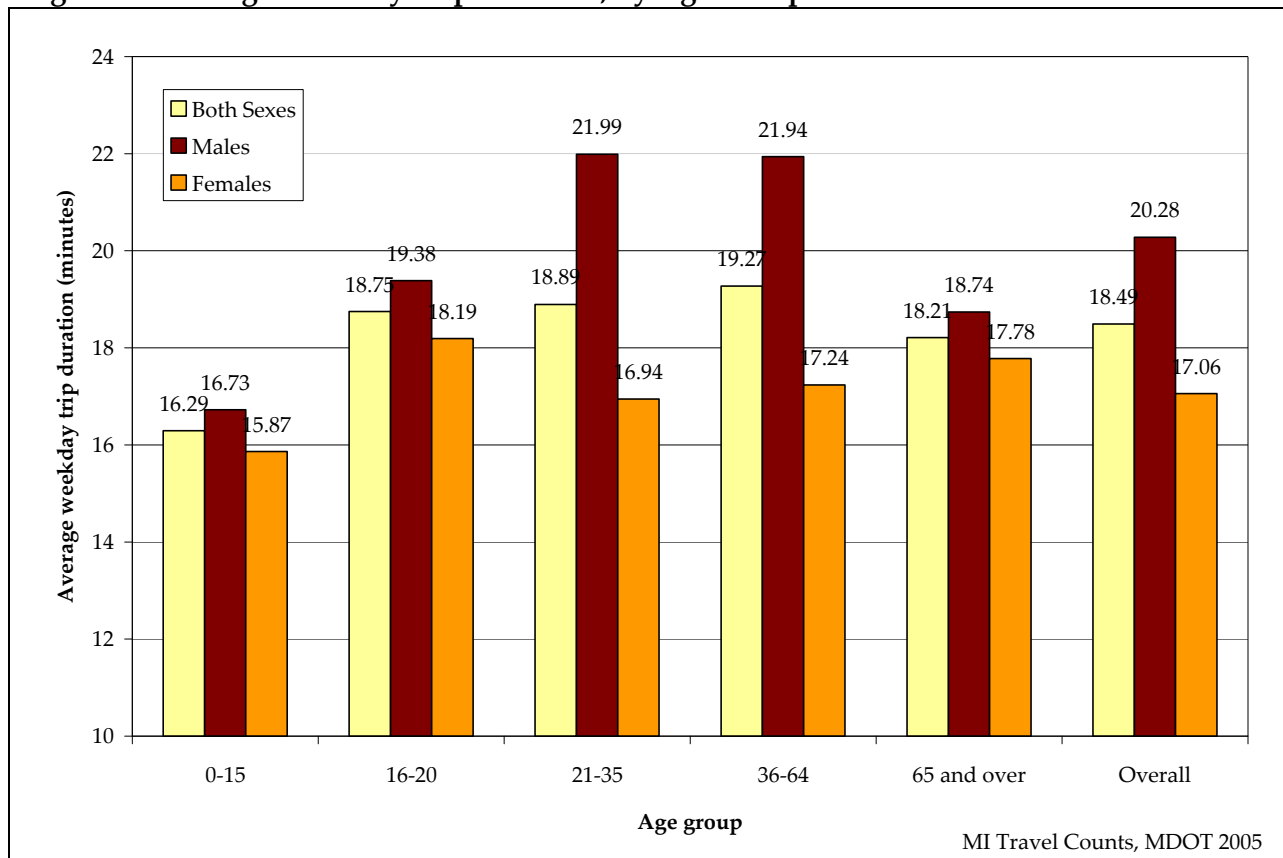
In addition to the type of community in which a household is located, other household characteristics are also important determinants of trip length and trip duration. Households with more people, including children, are expected to spend more time traveling, especially when auto availability is lower (due to high occupancy vehicle arrangements considered in **Section 3.1.1**).



Households with retired persons have overall lower trip duration due to the elimination of the peak hour commute, whereas households with more workers are likely to experience longer travel time since more of their travel occurs in the peak period (travel purpose by age is shown in **Table 3, Section 3.2.1**). While household characteristics offer some perspective into trip duration, analysis of travel time of individuals offers significantly more insight into this important characteristic of travel.

Males on average have longer travel times than females. This is especially obvious of men in the 21-64 age cohorts; **Figure 12** illustrates this difference. When compared to **Figure 9** (illustrating that women in the same age cohorts tend to make more trips), a gender effect is once again evident. Women in the 21-64 age cohorts experience travel durations more characteristic of women in other age cohorts than those of men in the same age cohort. However, this difference is significantly reduced when men reach retirement age. These findings suggest that the difference is likely due to trip chaining and other dynamics involving the peak-hour journey to work. Later in this report it is demonstrated that the journey to work affects men somewhat differently than women in those years of the life cycle when trip purposes depend largely on family and other roles. Also, the larger number of trips for women and the distribution of trip purposes explored in **Section 3.2** play roles in differences in trip duration by gender. The degree of flexibility in destination choice for work in comparison to other activities is also a factor in differences in trip duration by trip purpose.

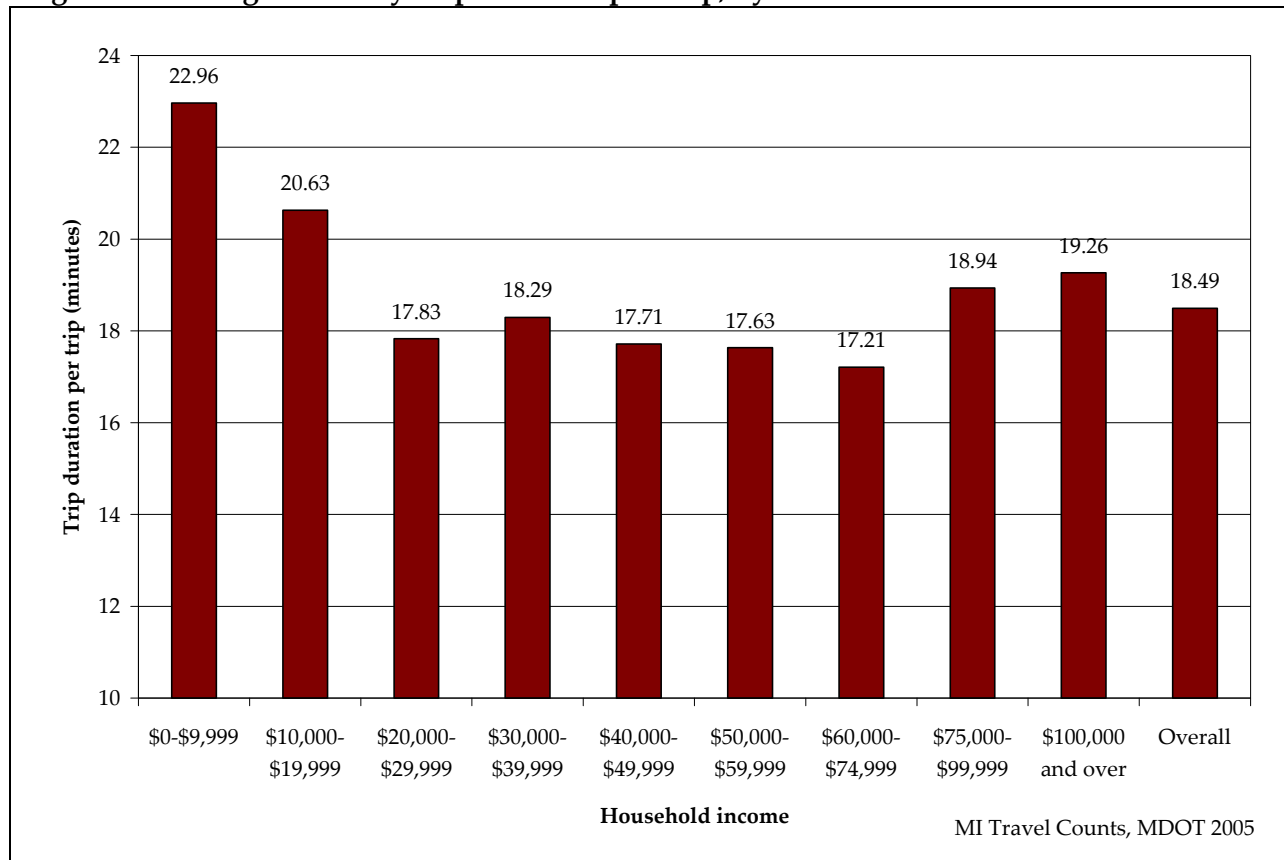
**Figure 12. Average Weekday Trip Duration, by Age Group and Gender**



The linkage between income and trip duration shown in **Figure 13** is notable. Those households with an income of less than \$20,000, on average, spend significantly more time per trip than all other income groups. This can be partially explained by the fact that low-income households tend to have fewer automobiles available, and therefore, they often use slower means of transportation, such as public transit or walking.

At the opposite end of the spectrum, those households with an income above \$75,000 tend to have higher trip durations as well. To some degree this finding may be an indicator of number of workers per household, with multiple-income households (entailing multiple peak-hour journeys to work) accounting for a larger share of the trips in these income groups. While higher-income households may also have access to additional vehicles and participate in activities that require longer trips, the exact nature of these activities is not implicit in this analysis. Trip purposes and activities are further explored in **Section 3.2**.

**Figure 13. Average Weekday Trip Duration per Trip, by Household Income**



### 3.1.3 Conclusion (Who is Traveling?)

This section explores Michigan's general population as transportation system users, providing a basis for better understanding of the utilization of the system in the time horizon of the *MI Transportation Plan*. In particular, trip rates are found to be greatly influenced by household size; larger households have more trips overall. Average trips per household also increase with each additional auto available and worker in the household, but to a much lesser degree than

that for household size. Trip rates also vary significantly depending upon personal characteristics such as gender and age. Women, in general, make more trips than men until after the age of 64. Trip rates increase with age for both genders, peaking for the age group of 36-64.

Average travel duration for the general population is found to be significantly different based on personal characteristics. On average, men make longer trips than women for all age cohorts. The longest trips overall are for men between the ages of 21 and 35. Observations in this section about why men have longer trip durations than women, why low- and high-income households have longer durations than middle-income households, and how employment status, age, and gender affect the user objectives lead to a more in-depth examination of trip purposes in the next section.

## 3.2 Why People Travel in Michigan

The characteristics described in the last section give an indication of who travels, and lend some insight as to how the transportation system enables travelers to access activities. However, a more explicit examination of trip purposes offers a clearer understanding of those activities requiring travel and supported by the transportation system.

The linkage between household income and trip rates indicates that many activities requiring travel in Michigan are discretionary (made at the leisure of the traveler, when resources are available). However, some activities are essential for health and sustenance, including work and participation in basic consumer markets such as grocery shopping, health services, etc. The theory of *induced demand* suggests that as the resources of the traveler increase and the time or monetary cost of traveling decreases, people participate in additional discretionary activities.

Induced demand is an important concept for understanding how a transportation planning strategy may support economic vitality. The induced demand for travel may also be understood as a latent demand for activities suppressed by the cost and time of traveling. In other words, the linkages between household trip rates and household income (and auto availability) suggest that the time and cost of travel may be factors suppressing the demand for some activities among low- and middle-income travelers. This section explores the purposes for which Michigan's travelers utilize today's transportation system to engage in activities.

### 3.2.1 Trips by All Purposes

**Figure 15** summarizes the statewide average daily trip rates by purpose for Michigan's population. The average person in Michigan makes 3.46 daily trips. Of this average, 1.75 trips per day are for shopping, personal, or recreational travel, compared to about 0.76 trips per day for work purposes. School and religious or community-related trips account for a smaller share of average daily trips.

It is important to note, with the exception of work, all trip rates can be affected by activities having been forgone, postponed, reduced, or increased, depending on the cost of travel. For example, while some basic shopping trips are likely to occur for health and sustenance

purposes, certain types of shopping activity may be more or less likely to occur depending on the time and cost associated with accessing markets.

**Table 3** demonstrates how trip rates vary between men and women at each stage of the life cycle for these trip purposes. The table supports the discussion in the previous section regarding life cycle factors affecting trip making and duration (**Figure 9** and **Figure 11**). **Table 3** shows that, in the working and parenting years of the life cycle (ages 21-64), men make more work trips, whereas women make more trips for all other purposes. Women aged 21-64 also make at least twice as many the number of pick-up/drop-off/accompany trips as men do, on average. **Table 3** also provides further insight into the patterns of retirees, with the observation that after reaching retirement age (65 and older), men make more trips for most activities than women.

The generational issues regarding cultural values and lifestyles are likely to make these trip rates and the associated gender differences in trip purposes dynamic in the time horizon of the *MI Transportation Plan*. As a younger generation enters the workforce and the parenting years of the life cycle, different values, preferences, and technology may change trip and activity patterns. Furthermore, as more “baby boomers” enter retirement, the dynamics of gender, travel, and activities are likely to change the demands on transportation infrastructure and services in Michigan.

**Table 3. Average Number of Daily Person Trips, by Purpose by Age and Gender**

Age Group	Gender	Work	School/ Childcare	Religious/ Community	Personal Business	Social/ Recreational	Shopping	Pick-up/ drop-off/ accompany	Total
0-15	Male	0.01	1.22	0.05	0.37	0.45	0.11	0.69	2.89
	Female	0.01	1.21	0.06	0.39	0.46	0.12	0.71	2.96
16-20	Male	0.45	1.26	0.05	0.32	0.61	0.18	0.32	3.19
	Female	0.47	1.16	0.04	0.42	0.67	0.31	0.43	3.49
21-34	Male	1.50	0.14	0.04	0.36	0.49	0.37	0.36	3.26
	Female	0.92	0.14	0.07	0.54	0.66	0.62	1.11	4.07
35-64	Male	1.47	0.02	0.07	0.57	0.56	0.53	0.44	3.66
	Female	1.03	0.03	0.11	0.67	0.66	0.78	0.82	4.10
65+	Male	0.33	0.00	0.11	0.83	0.73	0.74	0.35	3.09
	Female	0.15	0.00	0.15	0.67	0.62	0.73	0.30	2.61

*MI Travel Counts, MDOT 2005*

The differences in trip purposes by gender (especially in the 21-64 age cohort) are important because they indicate the travel patterns of persons in the parenting years of the life cycle, and they indicate different levels of demand on travel for workforce and market participation by households. **Figure 14** and **Figure 15** more explicitly compare trip purposes for men and

women, demonstrating that there is no single significantly dominant trip purpose for either gender. However, this illustration further quantifies differences in trip purposes, showing that, on average, work trips account for ten percent more of the males' trips than females' trips. The pick-up/drop-off/accompany and shopping purposes account for this share of female trips. This indicates that women use the transportation system to participate in consumer markets and to service the needs of others to a larger degree than men, who use the system somewhat more for workforce participation. However, it is very important to note that nearly 18 percent of women's trips are for work, and 28 percent of men's trips are for shopping and personal business. The use of the system by both genders for all of these purposes is vital to Michigan's economy.

**Figure 14. Distribution of Trips per Person, by Gender and Trip Purpose**

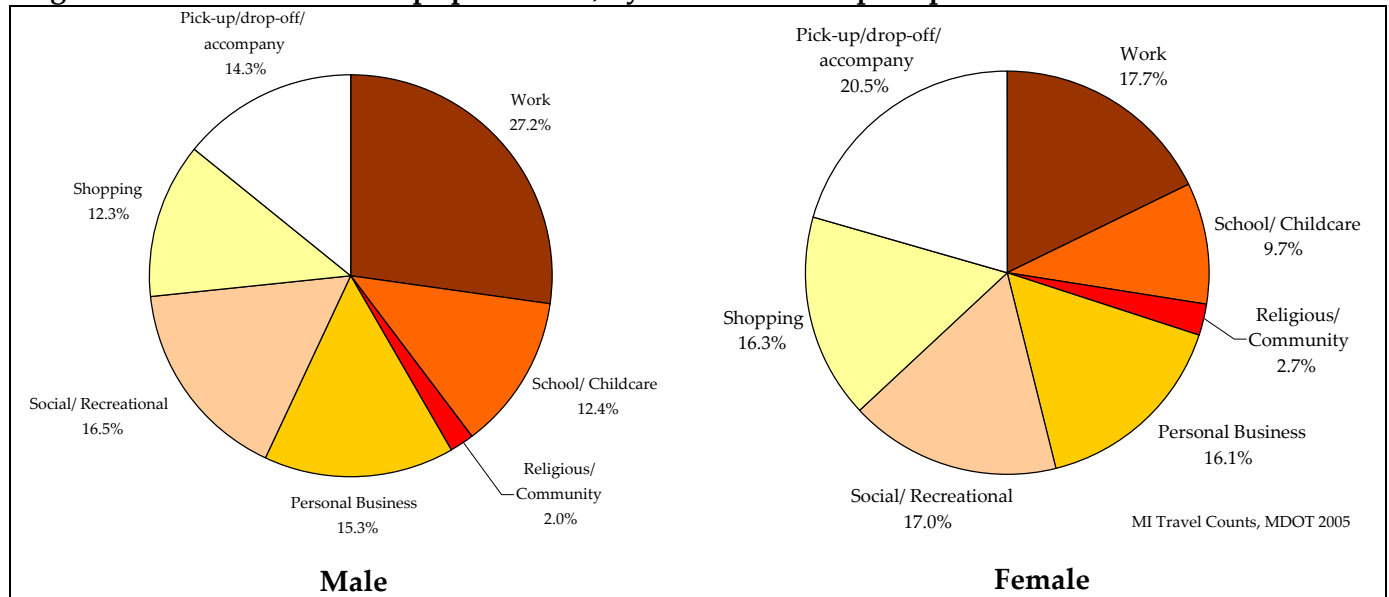
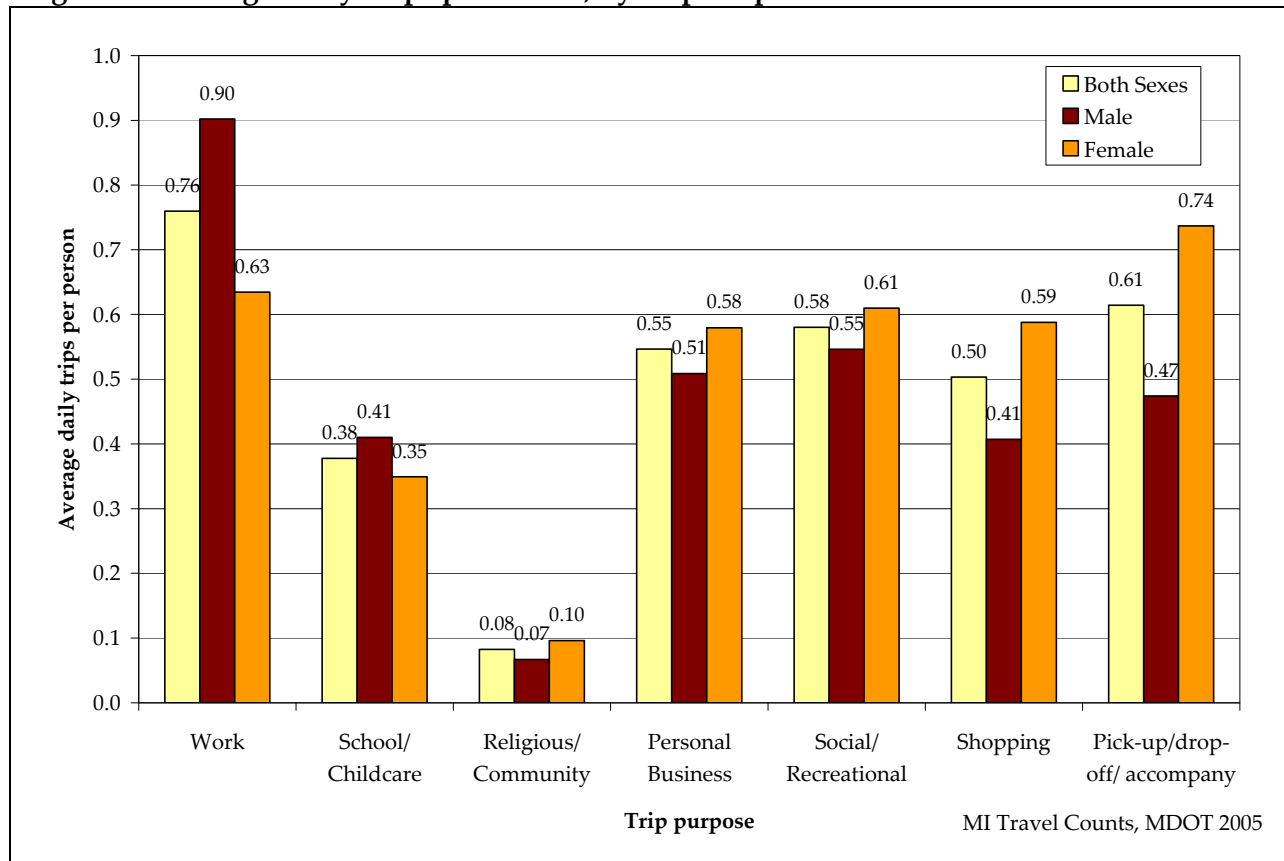


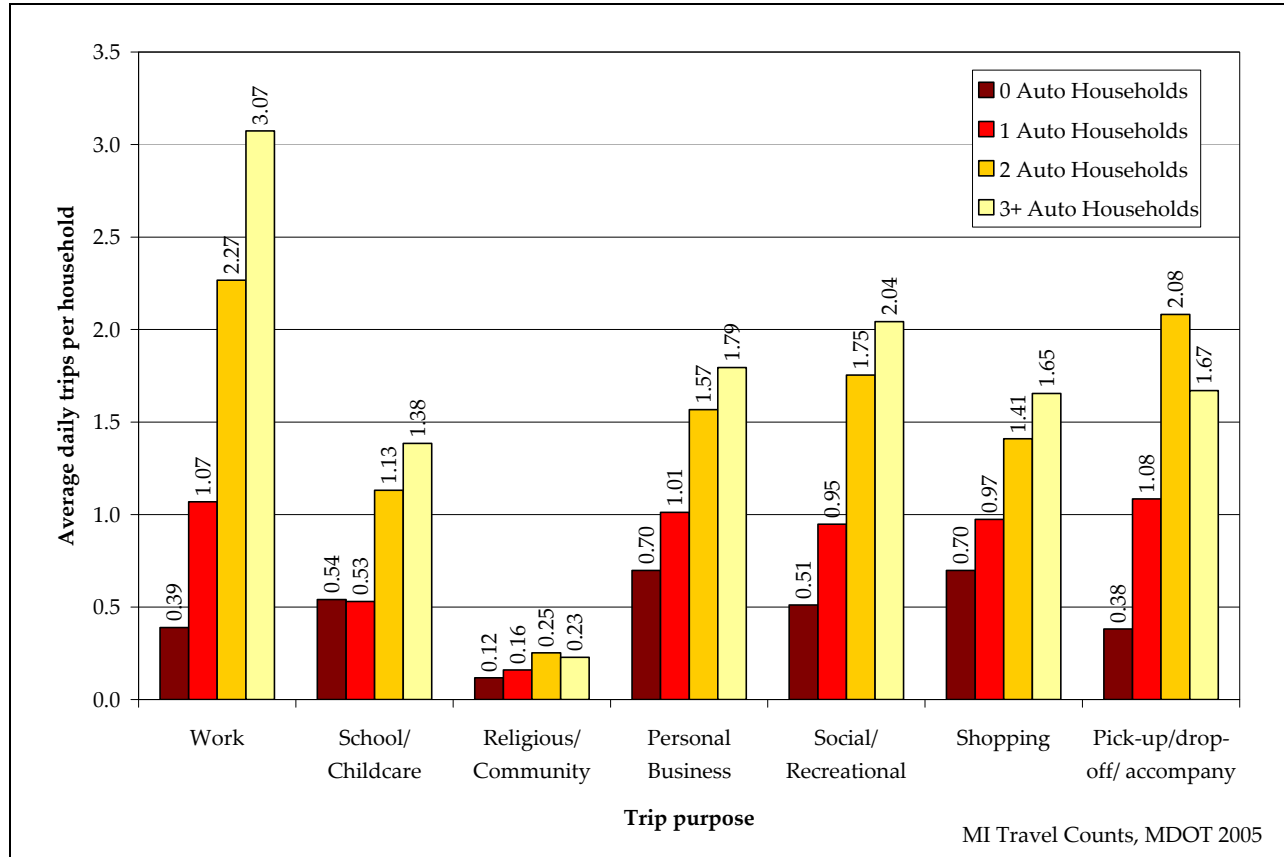
Figure 15. Average Daily Trips per Person, by Trip Purpose and Gender





Section 3.1 included discussion of the relationship between the number of trips, number of workers in the household, household income, and number of automobiles. In this section, it is appropriate to examine the trip purposes of households based on the number of vehicles. **Figure 16** demonstrates that households with more vehicles available generate significantly more work trips than households with fewer vehicles. This suggests that households with multiple automobiles may also have multiple workers making work trips. The incremental increase in trip generation for non-work purposes in multi-vehicle households is less than for work purposes. For example, a 3+ vehicle household, on average, generates 0.8 more work trips than a two-vehicle household; however, the increment is generally only half as large for other trip purposes. This suggests that larger, multi-vehicle households tend to utilize the additional vehicles more for work trips (supporting increased workforce participation by household members) than for other activities.

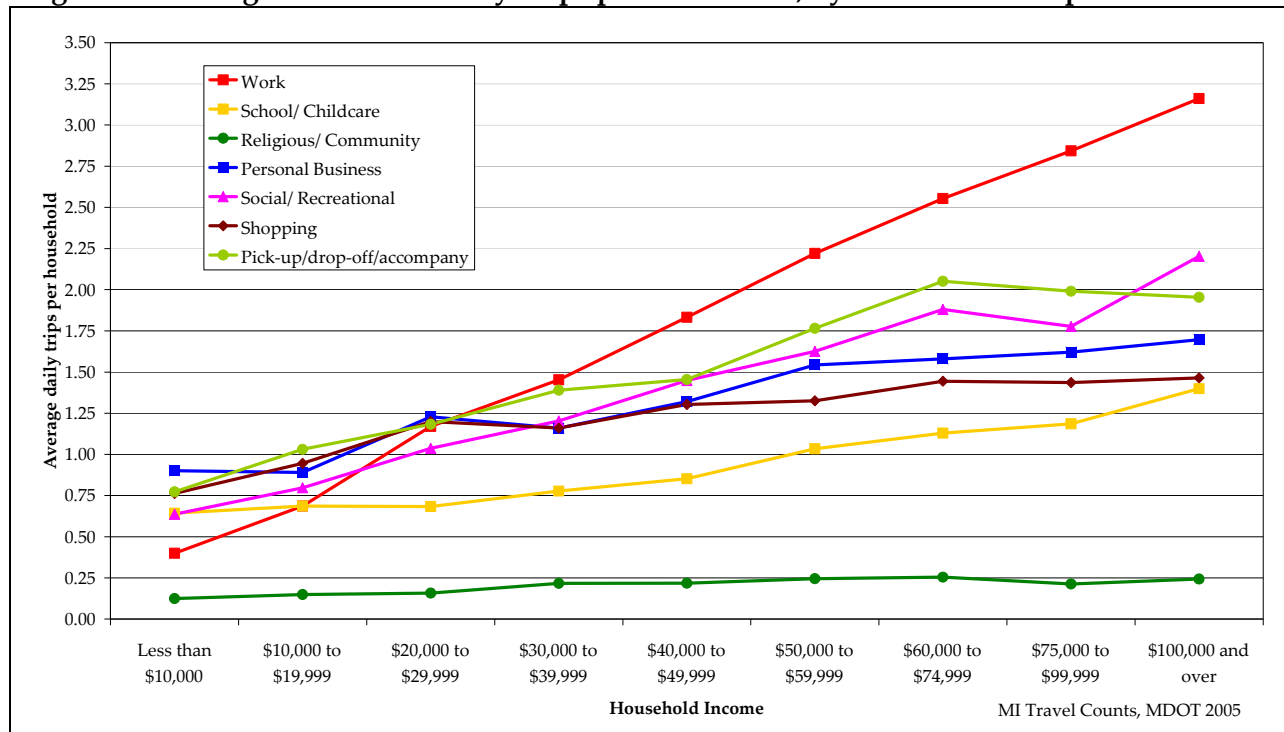
**Figure 16. Average Number of Daily Trips per Household, by Purpose and Vehicles Available**



The above analysis explores characteristics associated with large, multi-vehicle households supporting large numbers of workers and work trips. **Figure 17** below further explores this relationship, showing that while all trip purposes increase with household income, this relationship is most pronounced for work trips. As described above, this trend is largely accounted for by the number of workers in a larger household with possible multiple sources of

income. Both the personal and commercial transportation objectives of industry sectors and occupations are further discussed in the *Economic Outlook* and the economic impact analyses of the *MI Transportation Plan*.

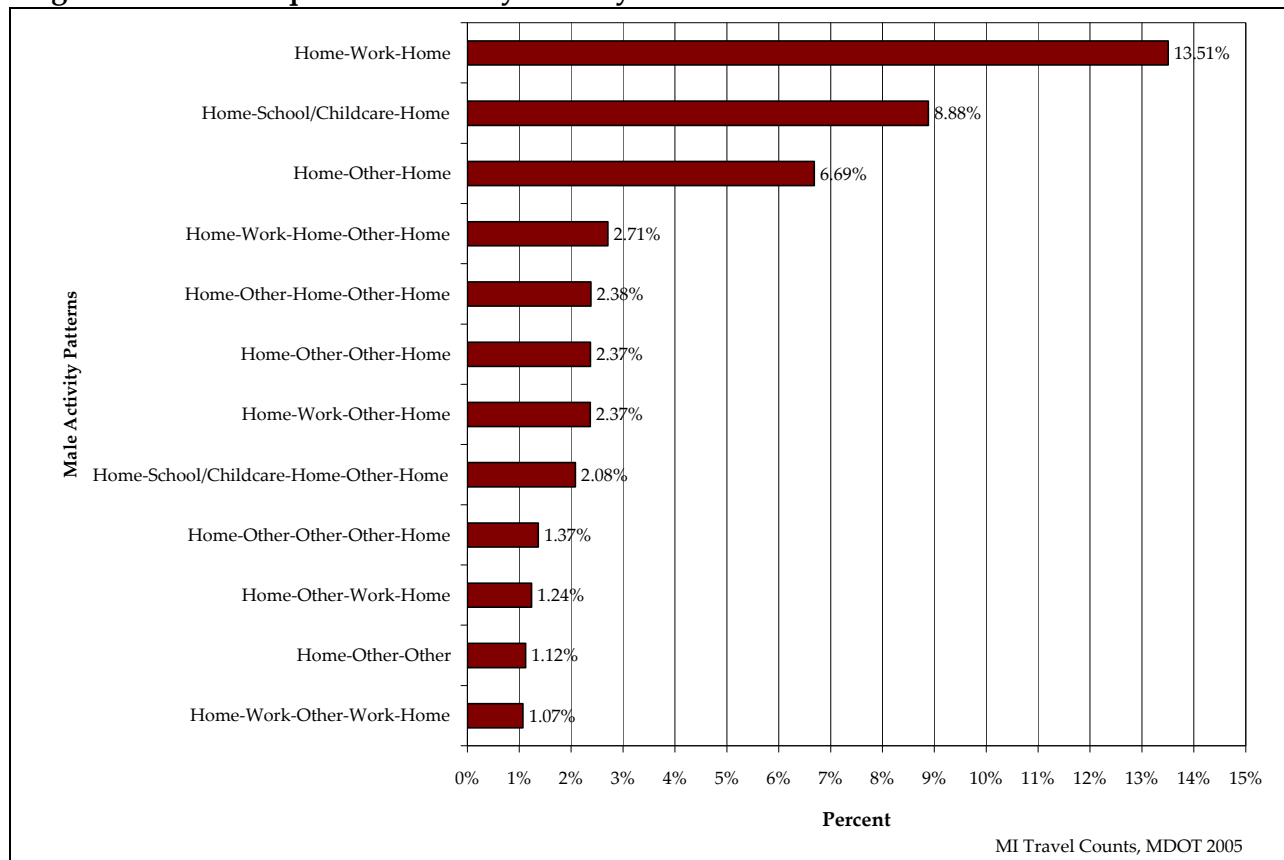
**Figure 17. Average Number of Daily Trips per Household, by Income and Purpose**

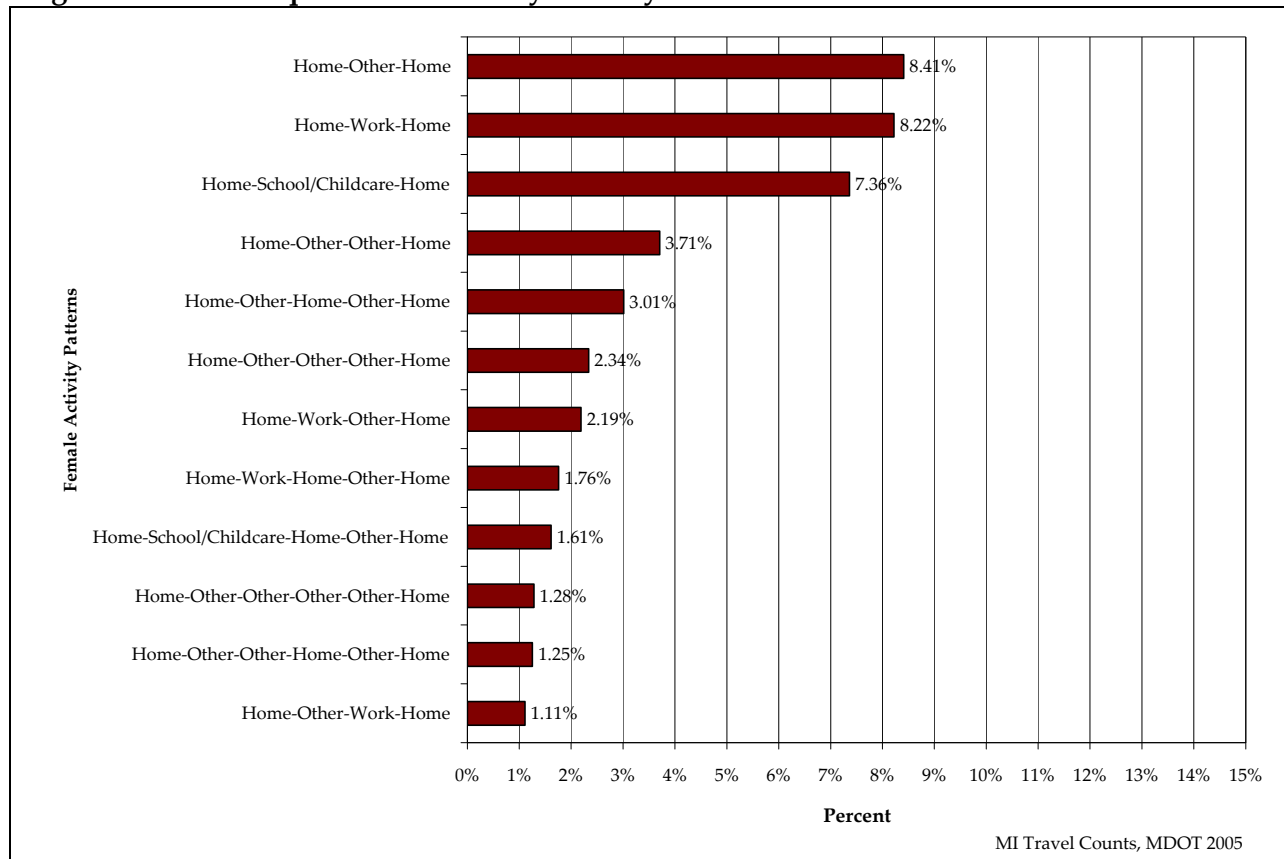


**Figure 18** and **Figure 19** demonstrate the most common daily trip patterns in Michigan for males and females. The simple work commute is the most common pattern followed by simple round trips to school/childcare and other activities. On average, about 26 percent of Michigan residents (24 percent of females and 29 percent of males) make only one simple round trip on a weekday.

Trip chains are cited in the *Transit Technical Report* as a barrier to transit use and a challenge for transit operations. Multi- and intermodal alternatives for trip chaining are likely to be an increasingly important issue in the time horizon of the integrated *MI Transportation Plan* as generational and life cycle changes continue to affect the nature of travel in Michigan. It is very important for the integrated transportation system to enable trip chaining, so as not to hinder participation in the workforce and consumer markets.

**Figure 18. Most Frequent Male Daily Activity Patterns**



**Figure 19. Most Frequent Female Daily Activity Patterns**

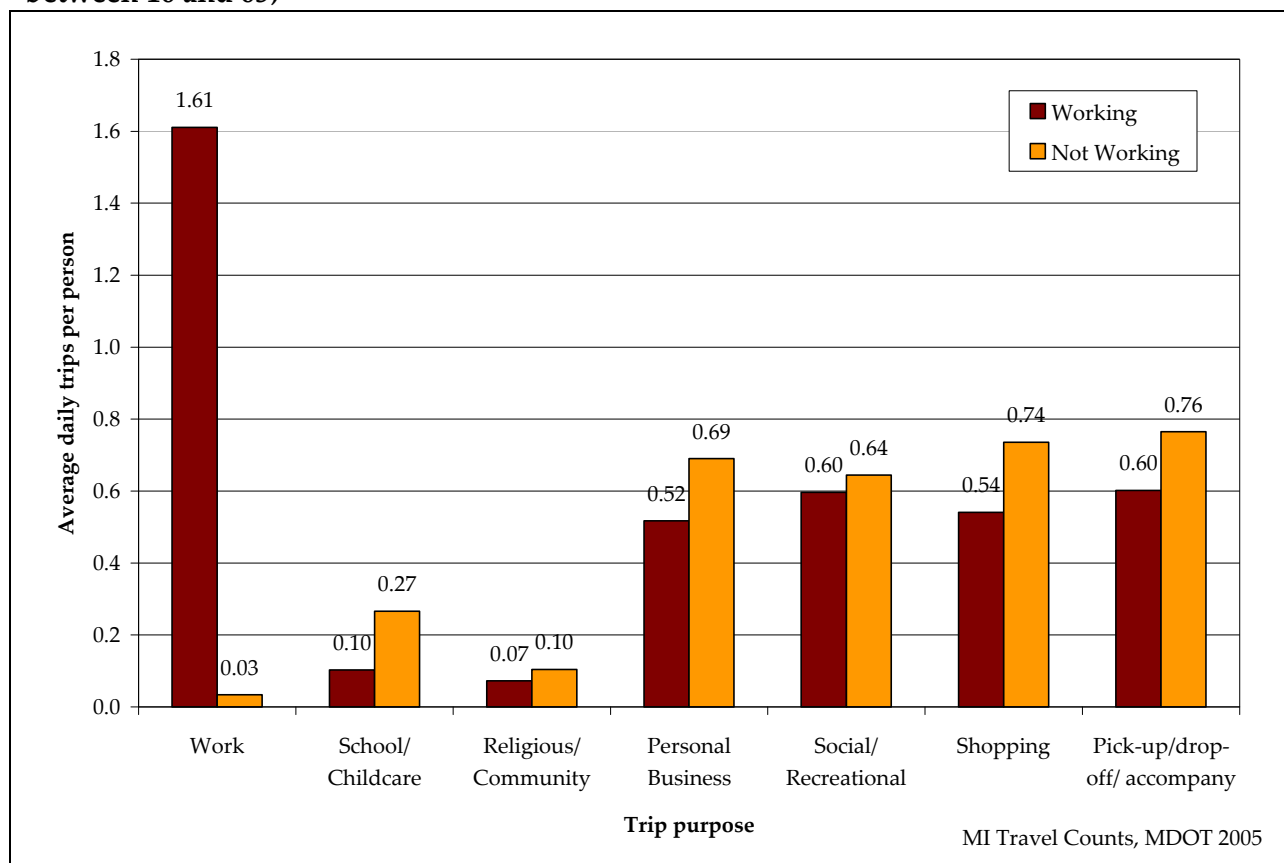
### 3.2.2 Trips by Working Status

Employment is a critical activity supported by Michigan's transportation system. **Section 3.1** and the above analysis of trip purposes have shown that those making work trips make fewer trips for other purposes and that this is especially true of men aged 21-64.

Because work is an activity of long duration—workers stay at their destinations for a long shift spanning many hours—it follows that workers may spend less time engaging in, and traveling to and from, other activities. **Figure 20** illustrates that non-working individuals consistently have higher trip rates for other purposes than members of the workforce. However, it is also important to note that workers make trips for all other purposes, and they make discretionary trips for social and recreational purposes at nearly the same rate as non-workers.

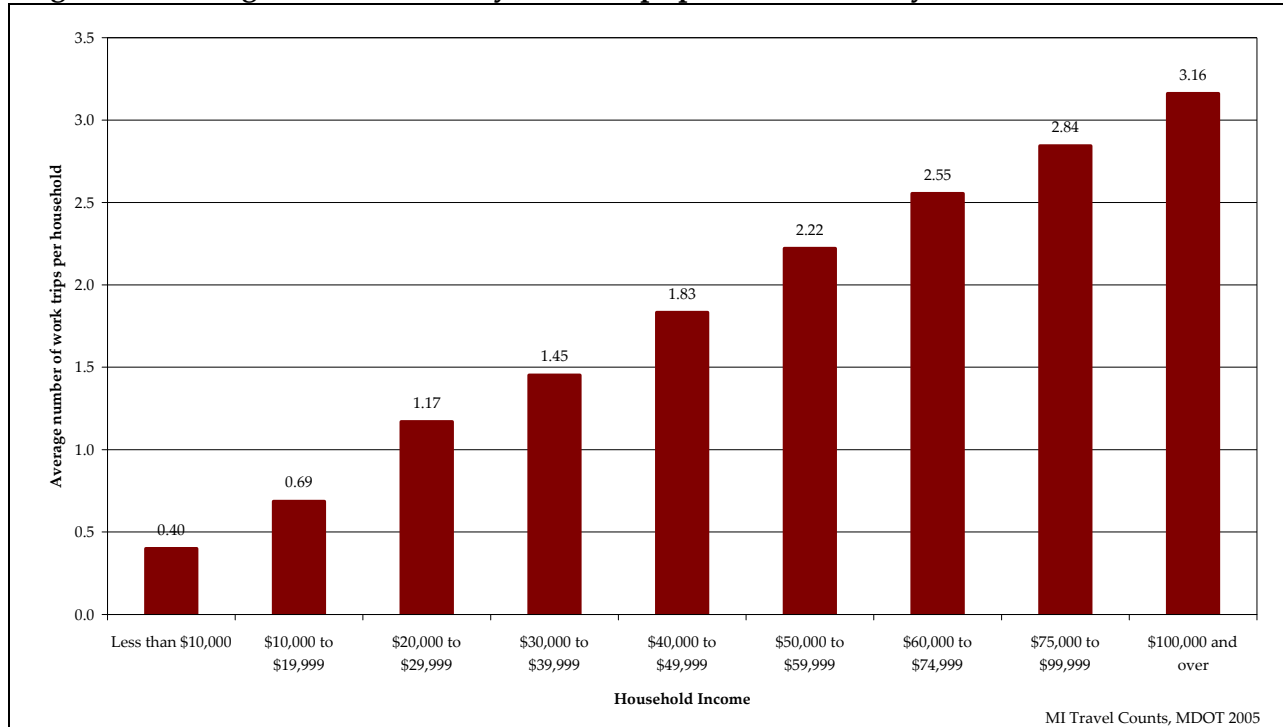
Notice that a small fraction of non-workers has reported trips for work purposes. That is because respondents may have considered the purpose of a trip as work-related even though they were not employed at the time the MI Travel Counts data was collected.

**Figure 20. Average Number of Daily Trips, by Purpose and Working Status (respondents between 16 and 65)**



The discussion of the impact of household income on travel has supported linkages between the number of workers, auto availability, and trip generation. These are complemented by the finding that there is a linear relationship between household income and the number of average daily household work trips (see **Figure 21**). The characteristics of higher-income households described throughout this report support the conclusion that households with more workers, more automobiles, and more people represent greater workforce participation, and greater utilization of the transportation system.

**Figure 21. Average Number of Daily Work Trips per Household, by Household Income**



Working at home (including telecommuting) consistently accounts for between five and ten percent of workers in all areas of Michigan. In each sample area, between 80 and 90 percent of workers work at locations away from home, suggesting that, throughout the state, working generally requires using the transportation system for a commute to a worksite away from home. Between 7.3 and 11.9 percent of workers in each sample area did not report work during the two-day survey period.

### 3.2.3 Conclusion (Why are People Traveling?)

This section has explored trip purposes and activities supported by Michigan's transportation system. Key findings include a gender difference in the 21-64 age group, with men using the system more for access to employment and women using the system more to participate in consumer markets and provide pick-up/drop-off/accompany trips. Women also make more trips on average than men.

The three most common daily trip patterns are the same for both genders; however, the percentage for each pattern varies significantly between the genders. While the most common daily trip pattern for men is Home-Work-Home, for women the Home-Other-Home pattern is predominant.

An important relationship between household size, income, and the level of workforce commuting has been explored, as have variations in trip purposes for different age cohorts and economic groups. Findings from this and previous sections will be further explored in the next section examining how the modal components of Michigan's transportation system support these purposes and activities.

### 3.3 How People Travel in Michigan

The attributes that characterize Michigan's traveling public provide insights into the different requirements, user objectives, and economic activities supported by all of Michigan's transportation modes. Each user accesses activities by different modes and combinations of modes in ways determined by the availability of modal options as well as the nature of destination activities and the distinct characteristics of the user. This section explores how the modes are used by Michigan's traveling public.

While some segments of the population are limited in available modal choices (those without vehicles or a driver's license, or those in areas without access to transit or too remote for walking), others are more sensitive to the qualities of the modes themselves. The nature or the location of activities can also be a determinant of mode choice. For example, on a discretionary trip for recreational or social purposes, travelers may be more sensitive to comfort and privacy than for a work trip.

Features and attributes to which travelers may be sensitive in the selection of modes include:

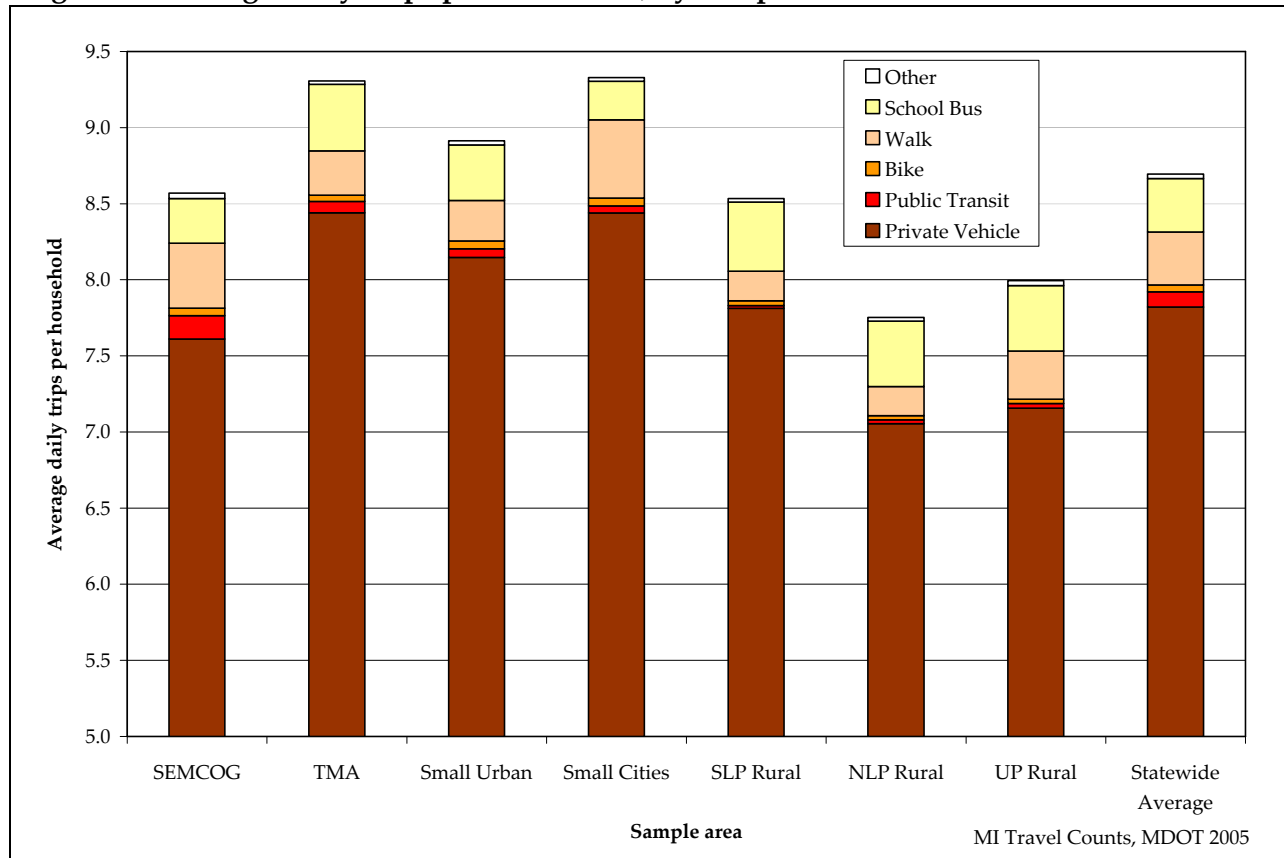
- Availability
- Convenience
- Safety
- Privacy
- Cost of time
- Cost of money
- Preference
- Choice
- Comfort

#### 3.3.1 Mode by Person and Household Characteristics

As shown in **Figure 22**, the private vehicle is the dominant mode of transportation for average daily trips throughout all sample areas. School bus and walking are the next most utilized modes, though in some sample areas one is more frequent than the other. Depending on the sample area, the fewest daily trips are taken by transit, bike, or other modes. Small Cities have the lowest number of school bus trips and the highest number of walk trips. Rural areas, such

as the Southern Lower Peninsula Rural area, have the lowest number of walk trips. Transit is found to account for a larger mode share in the SEMCOG area than elsewhere in the state. **Figure 22** illustrates the variation in modal trip rates by household for the seven sample areas of Michigan. Other technical reports of the *MI Transportation Plan*, such as the *Transit Technical Report* and the *Highway/Bridge Technical Report*, will further address the relative importance of the different modes throughout the state, using the findings of this section as a reference.

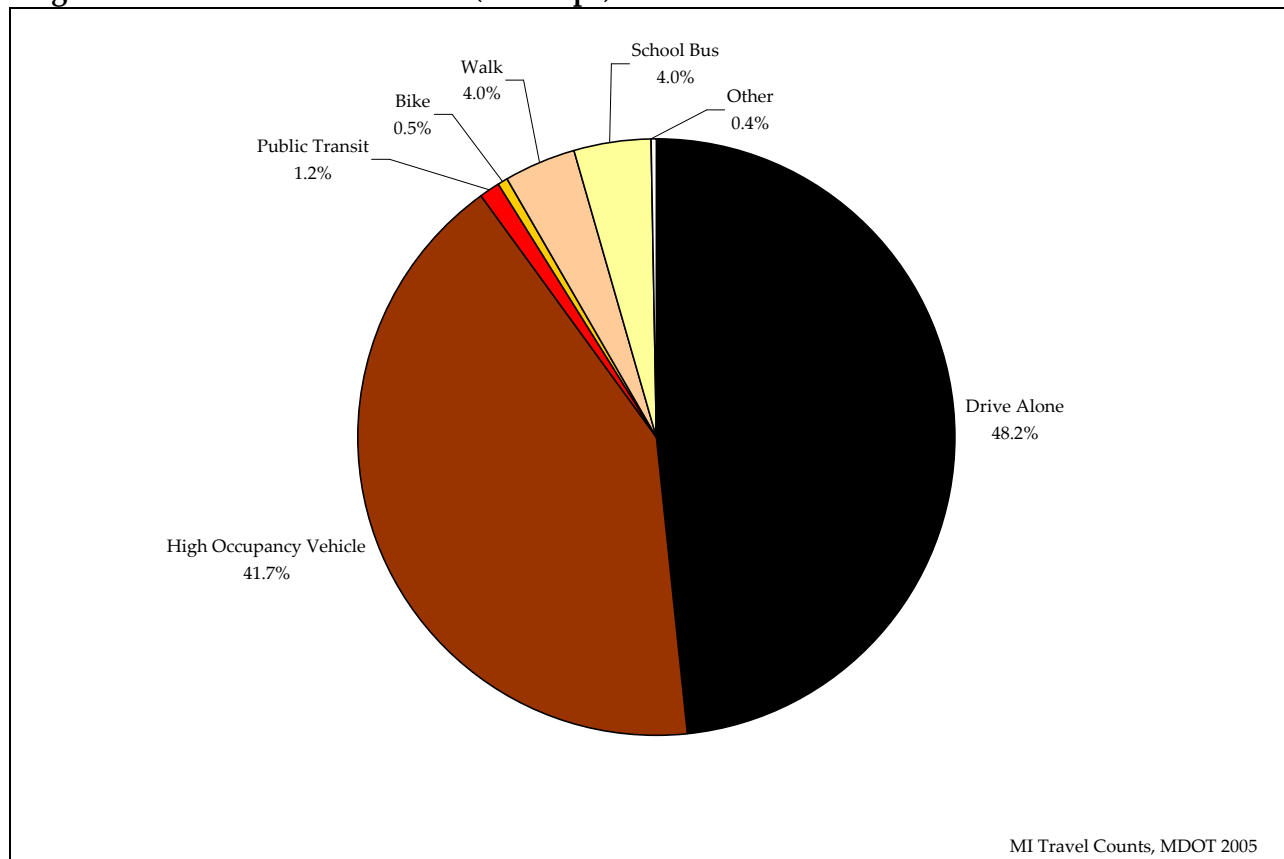
**Figure 22. Average Daily Trips per Household, by Sample Area and Mode**





The issue of vehicle occupancy plays an important role in understanding private vehicle travel in Michigan. **Figure 24** demonstrates that the majority of trips depend on private vehicles, and 48 percent of the total trips are made by people driving alone. High occupancy vehicle arrangements account for close to 42 percent of the mode share, with the balance comprised of a combination of school bus, walk, bike, and public transportation. **Sections 3.1** and **3.2** have explored some aspects of how high occupancy vehicle trips figure into trip purposes for families and households of different sizes and compositions, in particular, the high percentage of pick-up/drop-off/accompany trips made by women.

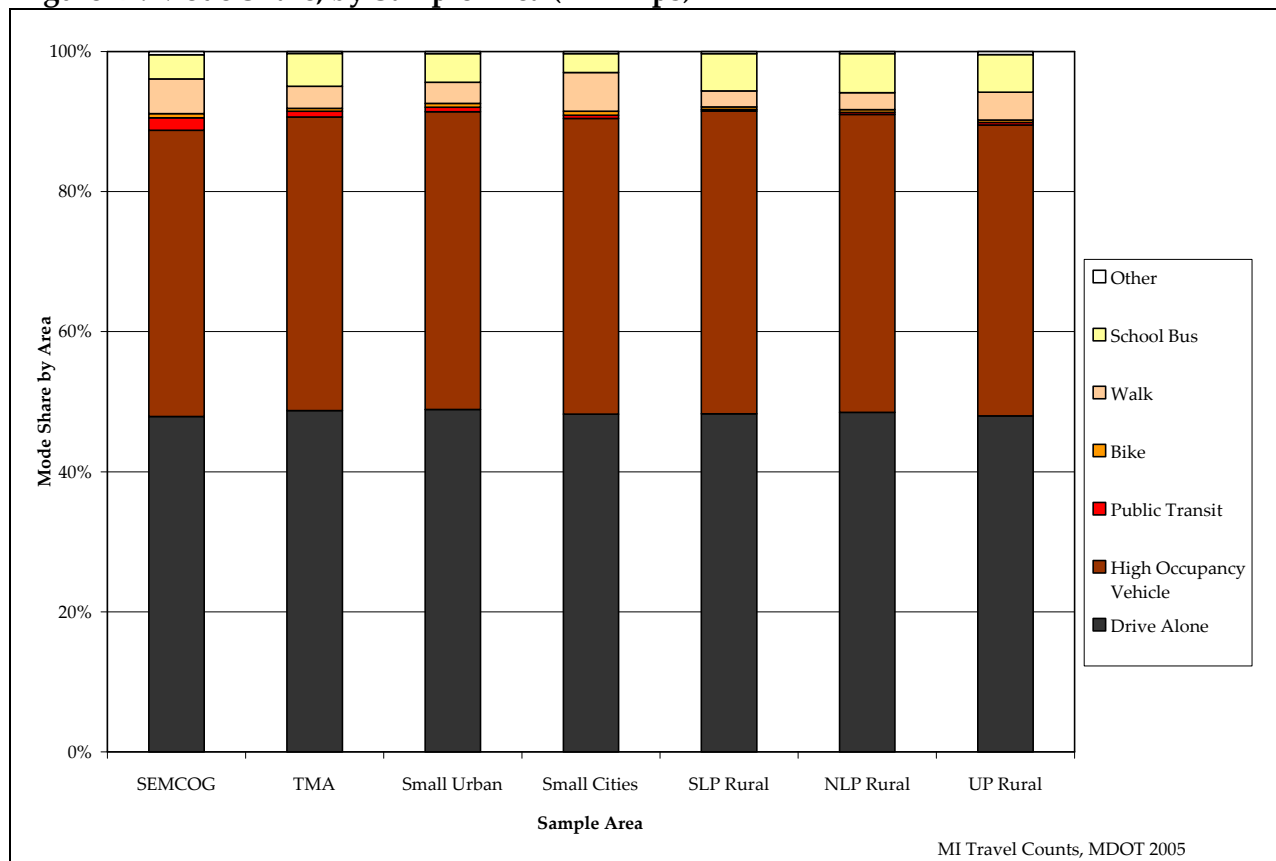
**Figure 23. Statewide Mode Share (All Trips)**



Michigan's reliance on private vehicle transportation indicates the importance of the state's road system. The accessibility, safety, and mobility for trips on this system are essential to enable travelers to engage in Michigan's workforce, consumer markets, and other activities. **Figure 24** illustrates the relative significance of the private vehicle modes (Drive Alone and Car Pool) by sample area.

School bus, walking, public transit, bike, and other modes comprise no more than 12 percent of the total mode share. **Figure 23** and **Figure 24** both indicate walking and school bus as a secondary mode of transportation in Michigan. Walking has a larger mode share in the SEMCOG area and Small Cities when compared to most areas of the state (see **Figure 24**).

**Figure 24. Mode Share, by Sample Area (All Trips)**

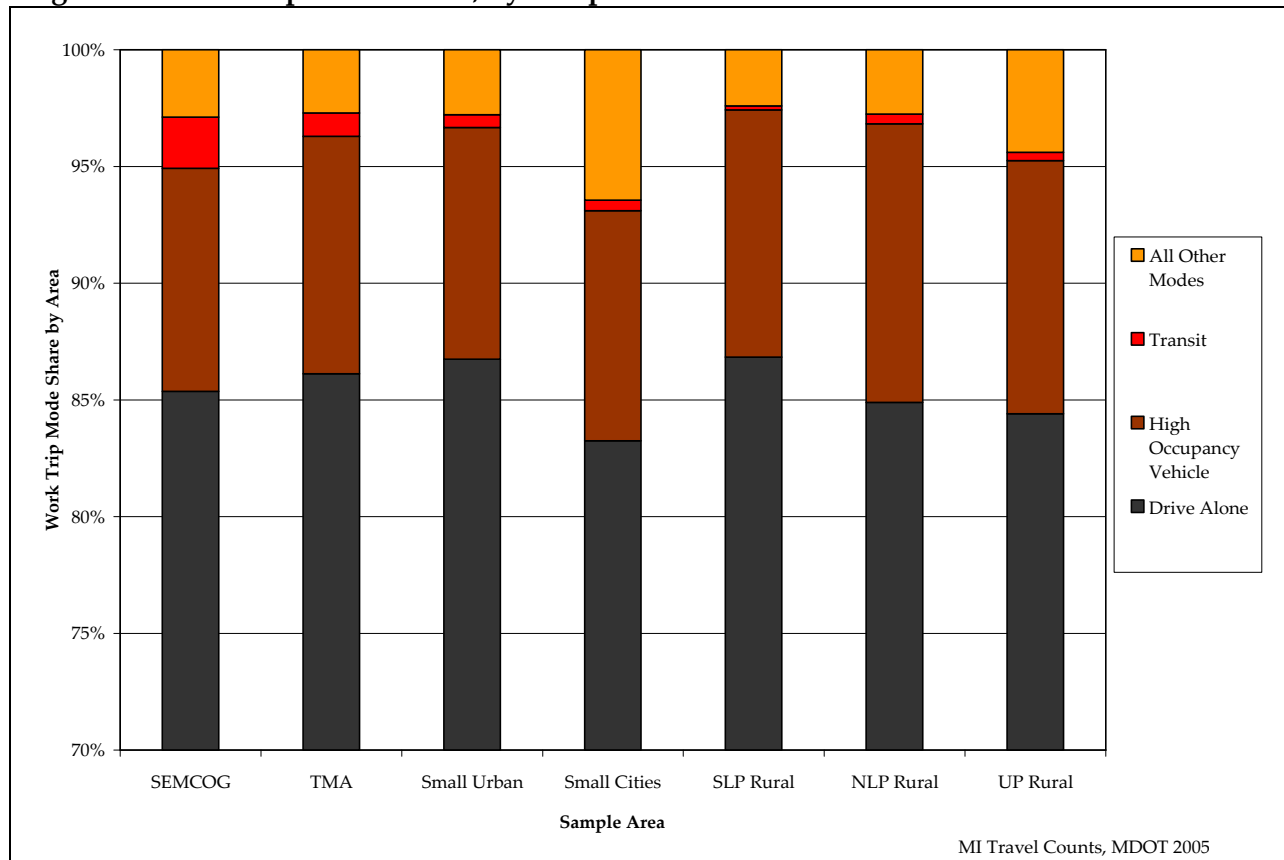


As shown in **Figure 25**, throughout all sample areas, 83 to 87 percent of all work trips are made by people driving alone. Approximately ten percent are by high occupancy vehicles (consistent in all areas) and five to ten percent use other modes of transportation. Public transit is significant only in the SEMCOG area, at just less than five percent.

It is notable that high occupancy vehicle arrangements accounts for a significantly lower share of work trips (driving alone accounts for less than 50 percent of all trips, but more than 80 percent of work trips in each area). This is consistent with the findings in previous sections regarding the trip purposes of families, where it was found that men aged 21-64 tend to make

more work trips, with women making more trips for other purposes—including pick-up/drop-off/accompany trips (which by definition imply a high occupancy vehicle).

**Figure 25. Work Trip Mode Share, by Sample Area**



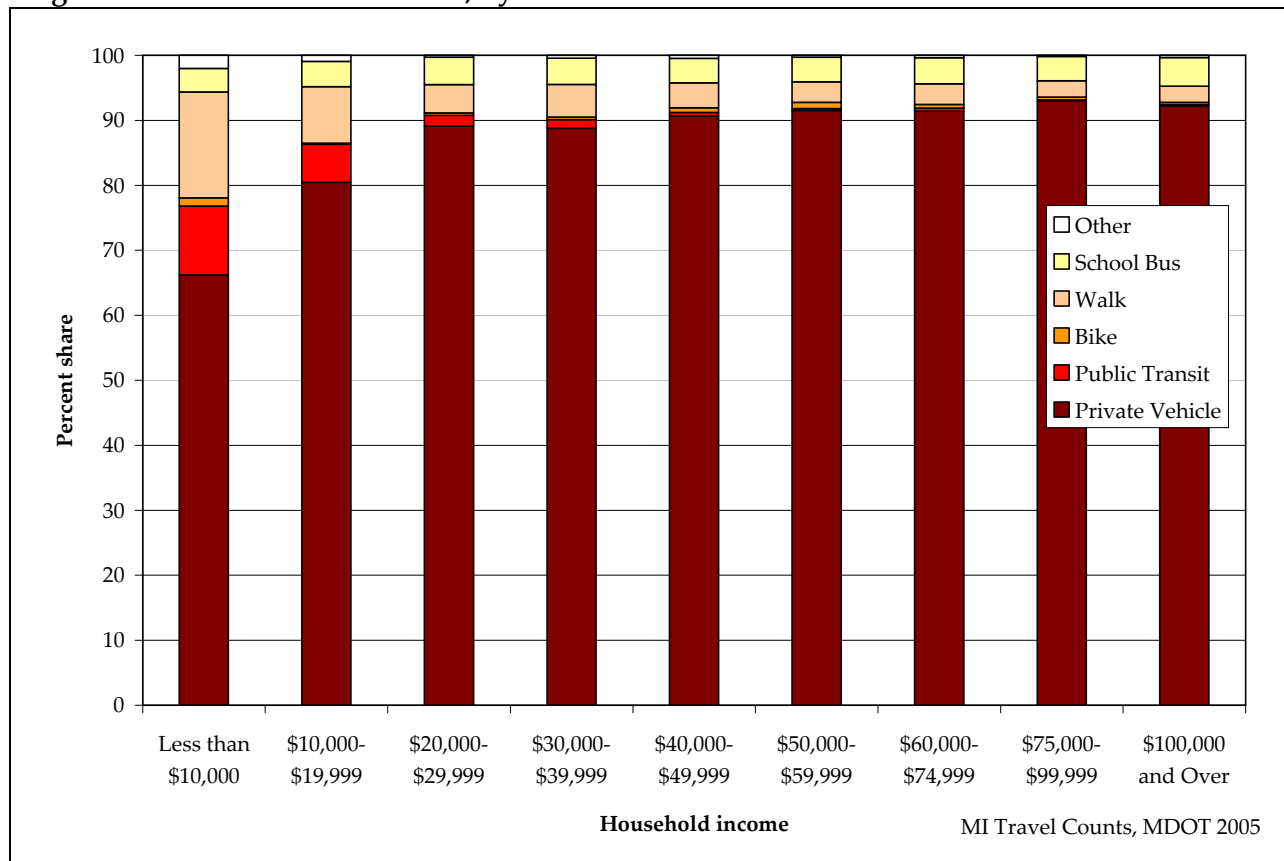
**Figure 25** further demonstrates the statewide reliance of private vehicles for work trips. The availability and utility of other modes are explored in other technical reports of the *MI Transportation Plan*, with the understanding that modal attributes are among the determinants of mode choice. **Figure 25** suggests that high occupancy vehicle arrangements, transit, walking, and other modes are not utilized for work trips as much as driving alone. The time and location sensitivity of work trips (importance of reaching the destination reliably and on time) may be a factor in these choices, as are the findings in **Section 3.2**, regarding trip chaining for work trips, with chaining being more difficult to accommodate through modes other than single occupancy vehicles.

Lower-income groups are more likely to use transit or walk than other groups. Households with annual incomes less than \$20,000 show a notably different modal share than higher-income groups. This is consistent with the findings in **Sections 3.1** and **3.2** in this technical report regarding automobile availability and trip making. The greater use of modes other than private vehicles by very low-income households emphasizes the need of modal alternatives for the state. The environmental justice issues raised in the *Socioeconomics Technical Report* of the *MI*

*Transportation Plan* highlight the importance of a system meeting the transportation objectives of this key segment of the population.

Furthermore, because private vehicles have been found in this report to have a predominant role in supporting work trips compared to other modes, and the challenges of arranging high occupancy vehicle trips on a regular basis, transportation alternatives for the working poor without access to private vehicles is an important focus for the *MI Transportation Plan*. This issue is further explored in this report with analysis of modal shares among those without access to private vehicles or driver's licenses.

**Figure 26. Statewide Mode Share, by Household Income**



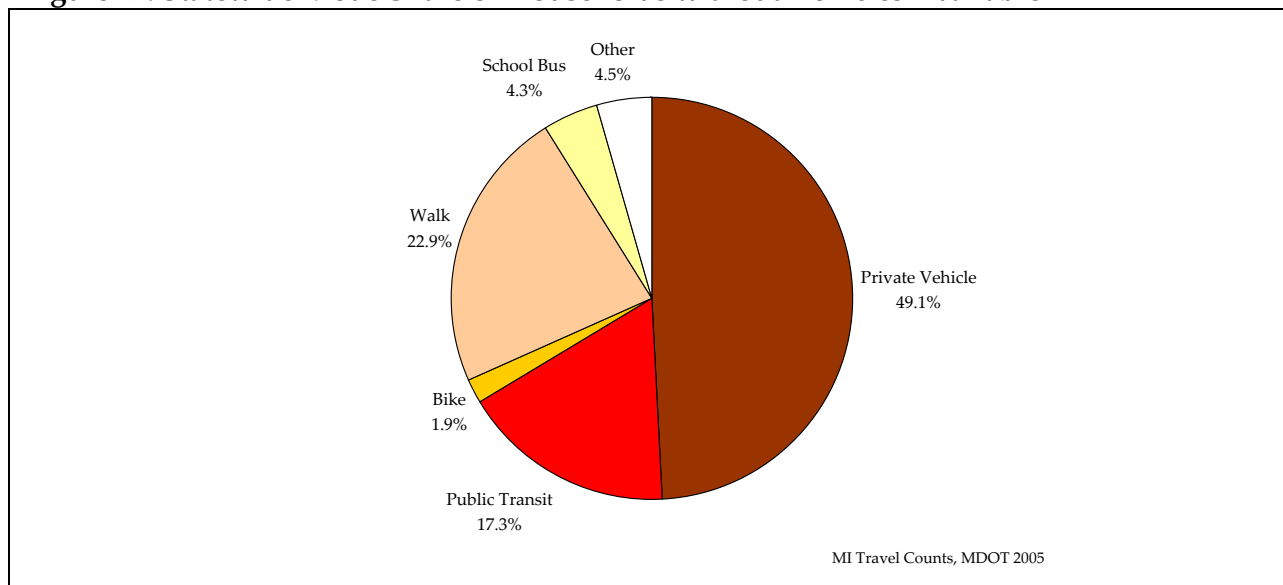
**Section 3.1** demonstrated that households without a private vehicle available make fewer trips than those with vehicles available. However, **Figure 27** shows zero-auto households are still dependent on private vehicles as the primary mode of transportation (nearly 50 percent). Walking and public transit are also significant modes for these households, accounting for 23 and 17 percent of trips, respectively.

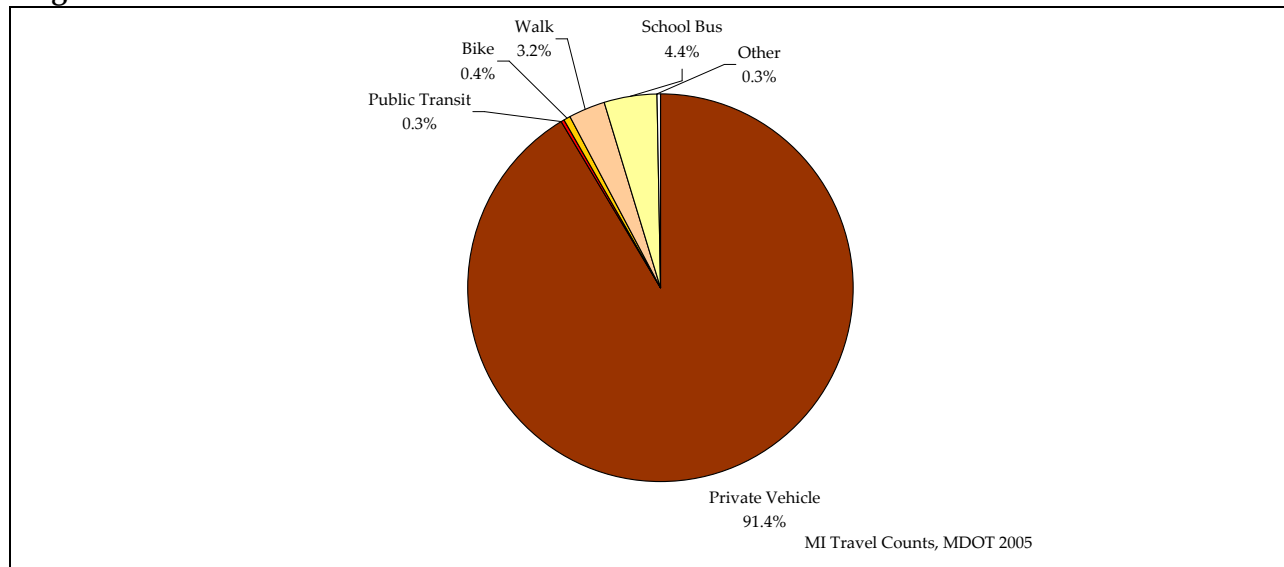
Households with one or more vehicles available significantly prefer using private vehicles. Private vehicle trips account for 91 percent of trips in households with vehicles available, in comparison to 50 percent of trips in households without vehicles available, as shown in **Figure 28**. When a private vehicle is available in the household, walking and transit are used to a significantly lesser degree. For example, walking accounts for only 3.2 percent of trips in

households with vehicles available, but 23 percent of trips in households without vehicles. The only aspect of mode choice not significantly affected by autos available is school bus use among children.

Some zero-auto households need assistance for transportation; the issue of accessibility to jobs and consumer markets for these households is especially important. In the *MI Transportation Plan*, the availability of transit, the safety of pedestrian facilities, the accessibility of activities by these modes, and the choices for arranging high occupancy vehicle trips are critically important to secure economic participation by members of zero-auto households. **Figure 27** and **Figure 28** illustrate the difference in modal shares between households without and with a private vehicle available.

**Figure 27. Statewide Mode Share of Households without Vehicles Available**

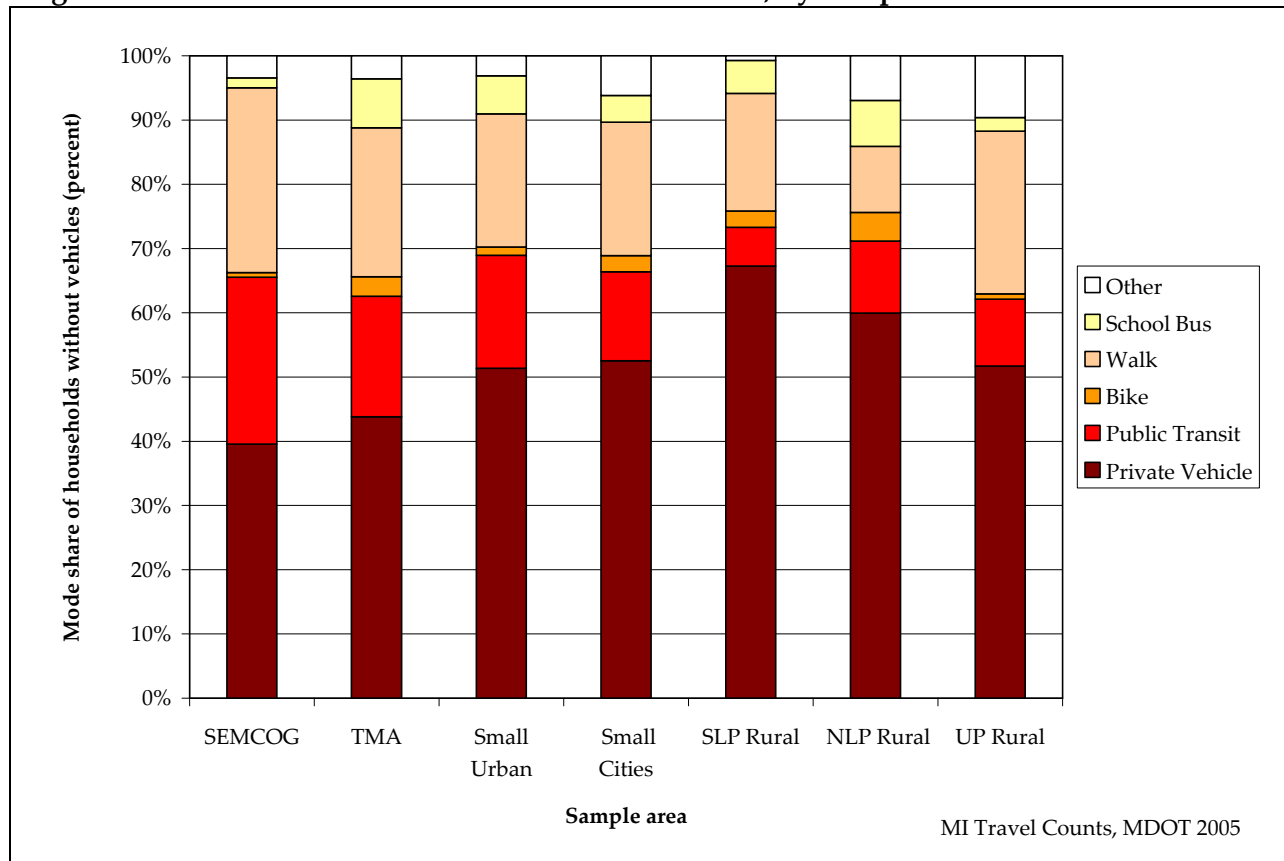


**Figure 28. Statewide Mode Share of Households with one or more Vehicles Available**

The above analysis has explored the relationship between auto availability and modal shares. While, on average, nearly 50 percent of person-trips of zero-auto households are made by private vehicles, it is important to note that different zero-auto households exhibit different modal shares. In other words, some zero-auto households utilize high occupancy vehicle arrangements, while others are more reliant on transit, walking, and other modes.

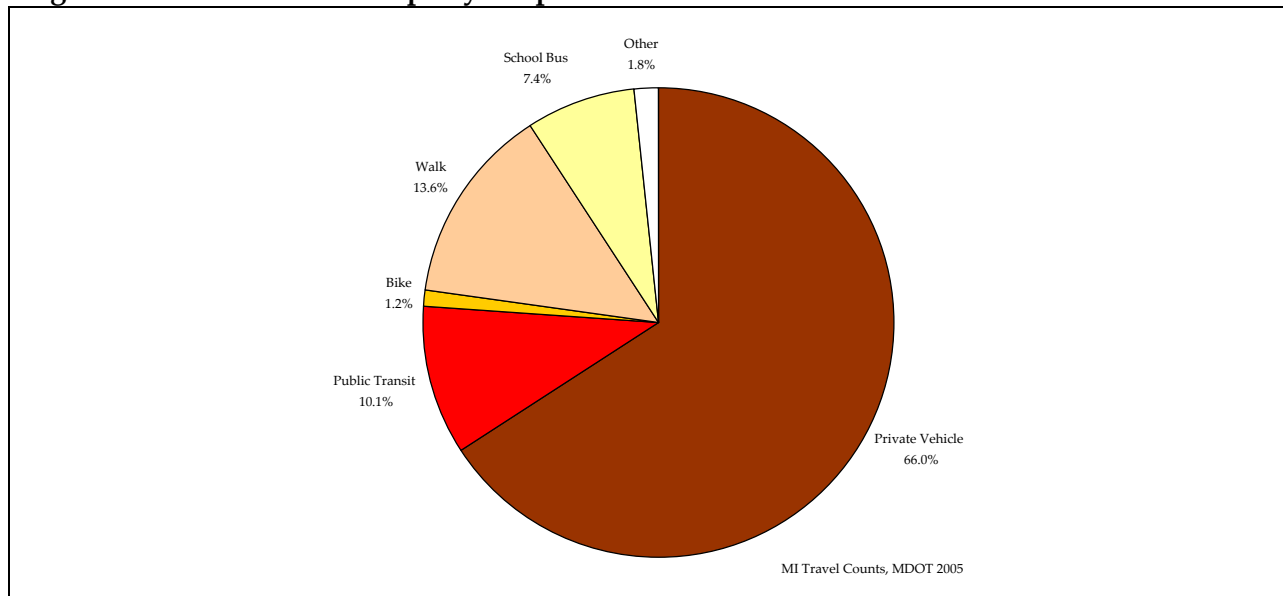
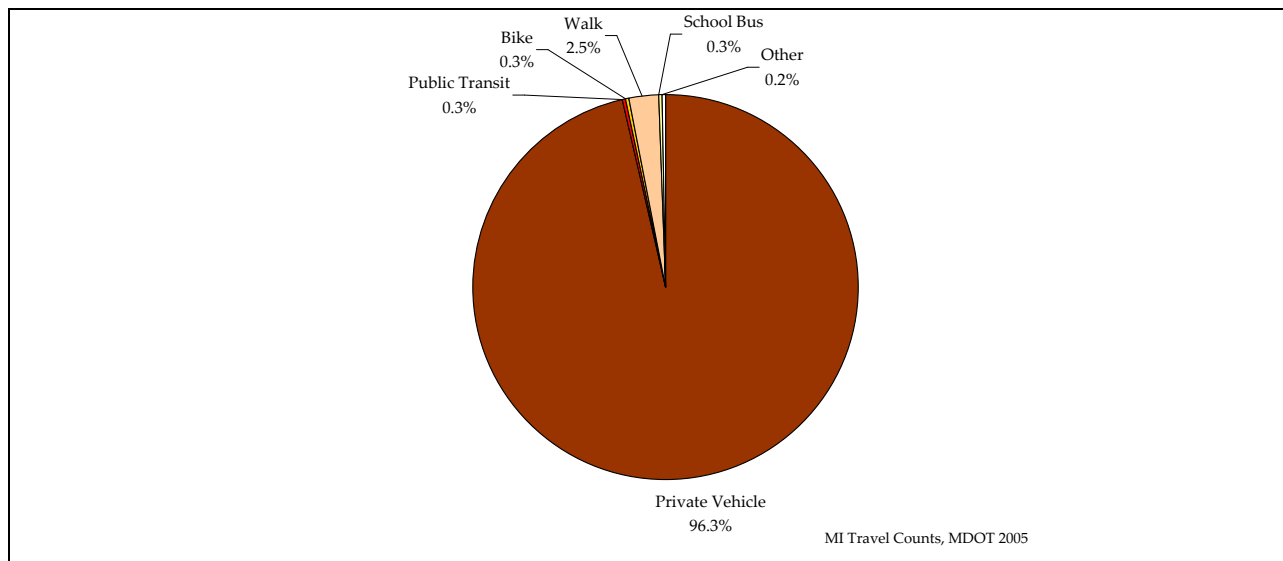
Location is an important determinant of modal shares in zero-auto households. **Figure 29** illustrates how modal shares in zero-auto households vary in different areas of Michigan. In urban areas where fixed-route transit is available, and where densities support walking as a viable means to activities, the dependency on private vehicles among zero-auto households is less than in other areas.

The difference of modal shares illustrated in **Figure 29** suggests that in areas served by fixed-route transit (SEMCOG, TMAs, and some Small Urban Areas and Small Cities), transit is used by members of zero-auto households, offering a viable alternative for accessing economic activities. Besides transit, walking is a mode consistently used by travelers in households without vehicles, in all areas of the state.

**Figure 29. Mode Share of Households without Vehicles, by Sample Area**

In most areas of the state, those without driver's licenses (over the age of 15) still rely on private vehicles as a primary mode of transportation. It is notable that walking is the secondary mode for males of this group in the UP Rural area. In Small Urban Areas and Small Cities, those without a driver's license take advantage of transit as a modal option and walking is often an important mode. Except for the Northern Lower Peninsula Rural area, females without a driver's license use more private vehicles than males. As with those in zero-auto households, females without driver's licenses are found to take advantage of transit. Males in all sample areas bike more than females.

**Figure 30** shows the mode shares for those without a driver's license. The primary mode for this group is the private vehicle, at 66 percent, followed by walking and public transit, at 14 and 10 percent, respectively. **Figure 31** demonstrates that 96 percent of trips made by licensed drivers use private vehicles.

**Figure 30. Mode Share of Trips by People without a Driver's License****Figure 31. Mode Share of Trips by People with a Driver's License**

### 3.3.2 Mode by Purpose

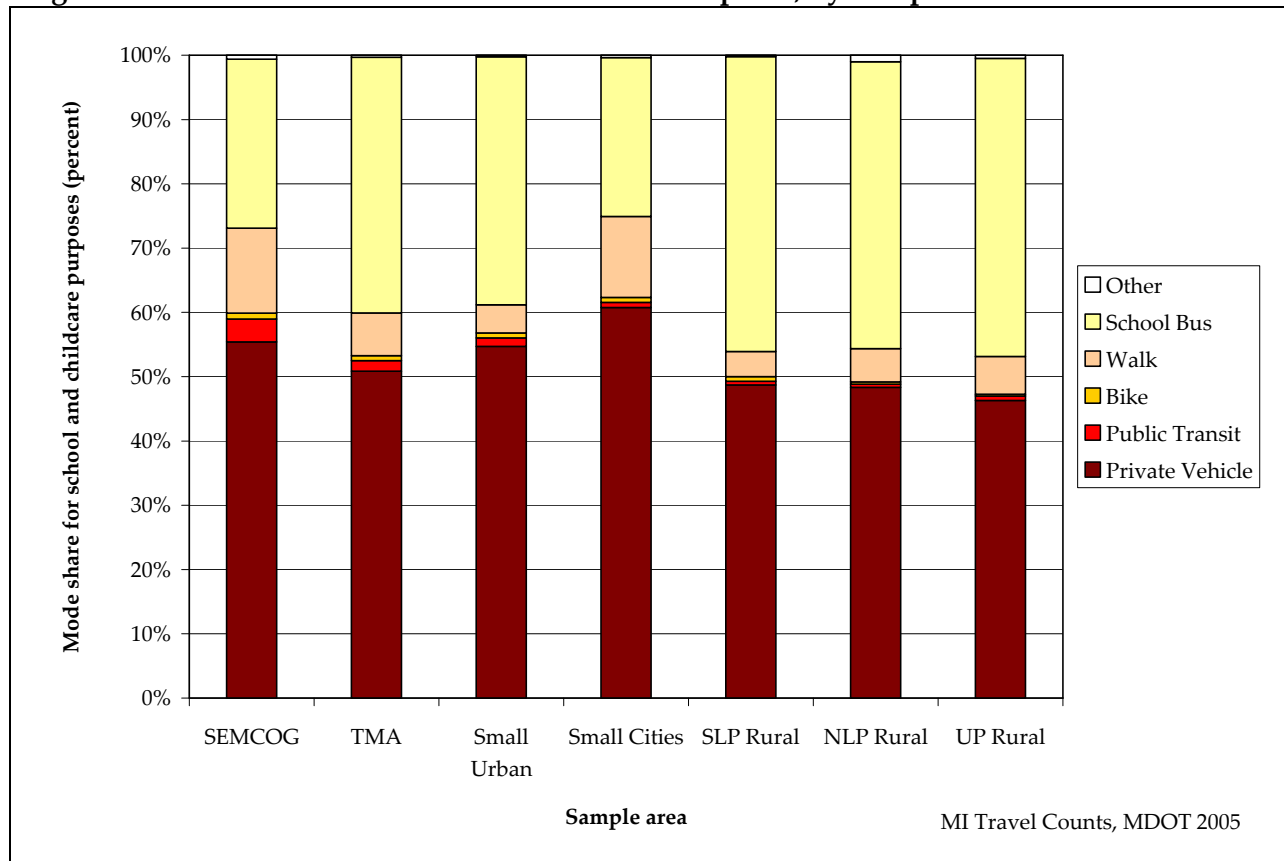
Because Michigan's transportation system is critical to enabling people to participate in activities, it is important to understand how the modal components of the system support those activities critical to Michigan's economy. The modal shares for most of the trip purposes examined in this report are reflective of the overall shares described above. However, school and childcare activities have a different modal distribution than the statewide shares described above.

**Figure 32** illustrates how modal shares for school and childcare vary in different areas of Michigan. Private vehicles and school buses are the primary modes of transportation for



school/childcare purposes. Walking is the third most frequent choice for this purpose, although at most it is 15 percent of total mode share. In rural areas, the percent of school bus trips for school/childcare is higher than urban areas.

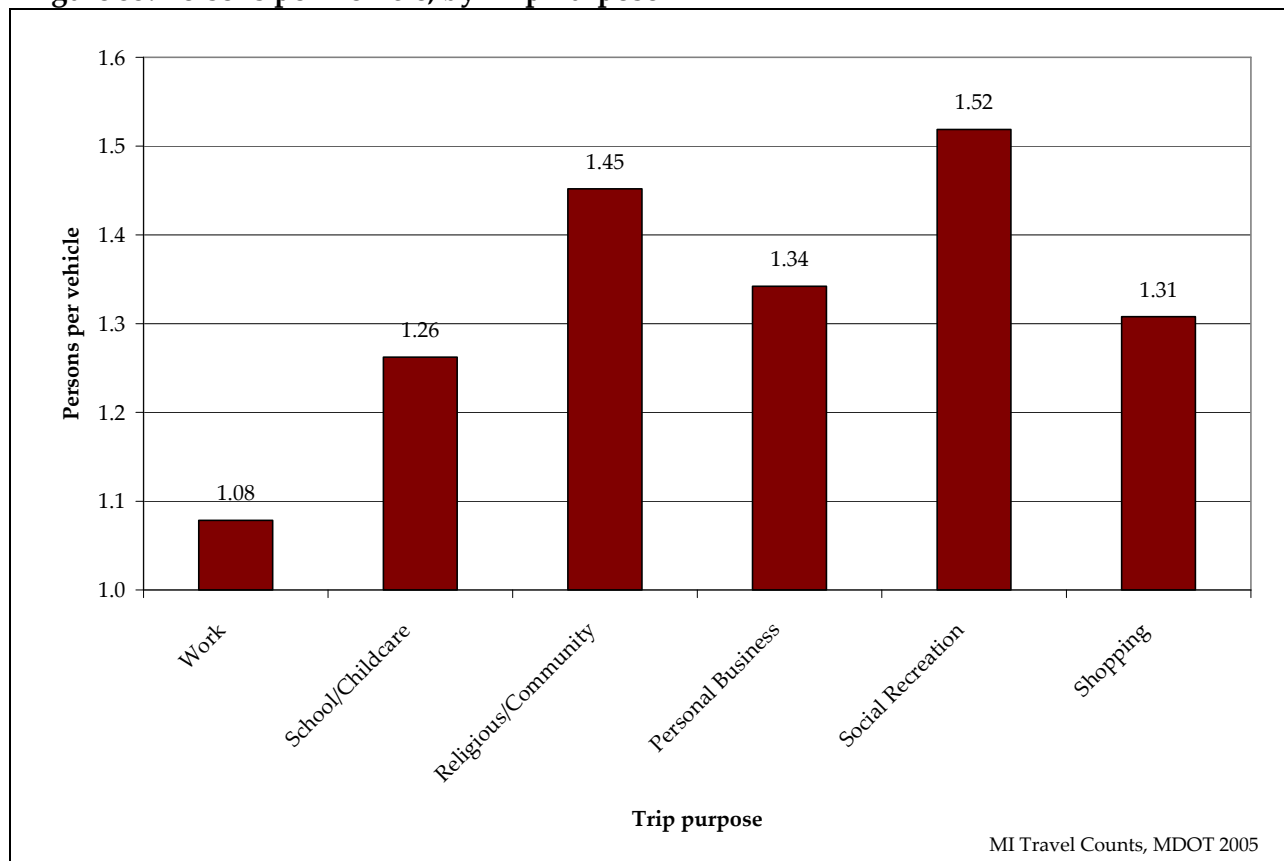
**Figure 32. Mode Share for School and Childcare Purposes, by Sample Area**



While private vehicle transportation is dominant for all trip purposes in Michigan (to a lesser degree for school and childcare activities), previous discussions in this report have demonstrated the importance of arranging high occupancy vehicle trips. **Figure 33** further examines high occupancy vehicle trips in Michigan by comparing vehicle occupancy rates for different activities.

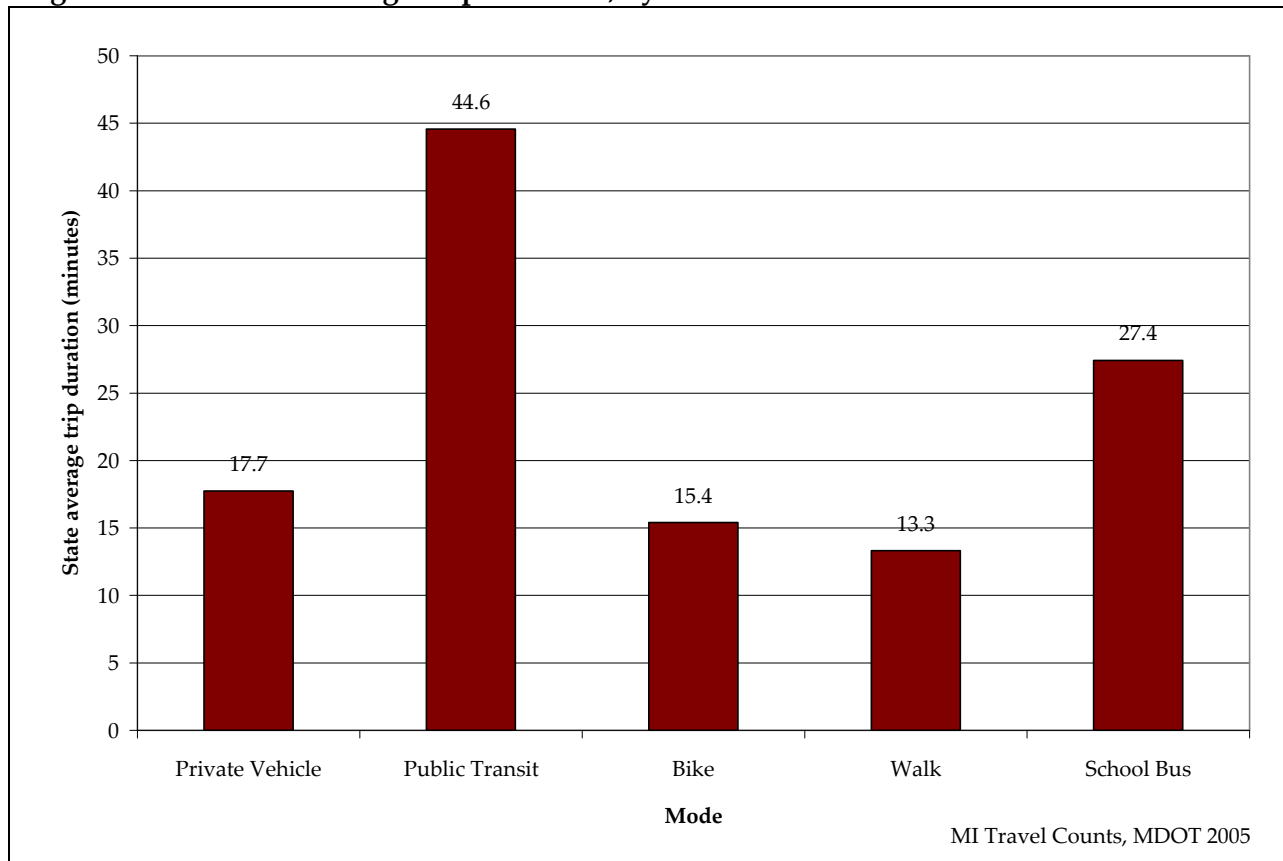
Vehicle occupancy for the daily work commute is the lowest of all trip purposes. Group-oriented activities such as social/recreational and religious/community activities show the highest vehicle occupancy rates. Personal business, shopping, and school/childcare activities have moderate rates of high occupancy vehicle trips. Vehicle occupancy by trip purpose among sample area is relatively consistent statewide.

**Figure 33. Persons per Vehicle, by Trip Purpose**



### 3.3.3 Duration of Trip by Mode

**Section 3.1** of this report explored travel duration for different segments of Michigan's population. This section explores the relative duration of travel by mode. It is important to note the difference between the duration of a modal trip and the delay associated with a mode. For example, duration may be affected by the length of trips as well as the speed with which the mode facilitates access to activities. The *Transit Technical Report* of the *MI Transportation Plan* indicates long wait and transfer times as a major barrier to accessing activities for those using transit.

**Figure 34. Statewide Average Trip Duration, by Mode**

The relative duration of travel by mode is one determinant of mode choice where multiple modes are available for the same trip. Higher travel times (for example, a long transit wait or transfer time on a transit route) may discourage the choice of transit as a mode for a particular trip or chain, or may discourage a transit user from making a stop and engaging in an activity. The same is true with the effects of congestion on the duration of a private vehicle mode. Consequently, controlling the travel time of modes is important in developing a transportation system to provide Michigan's travelers optimal access to jobs, markets, and other activities. **Figure 34** compares the duration of trips by modes in Michigan.

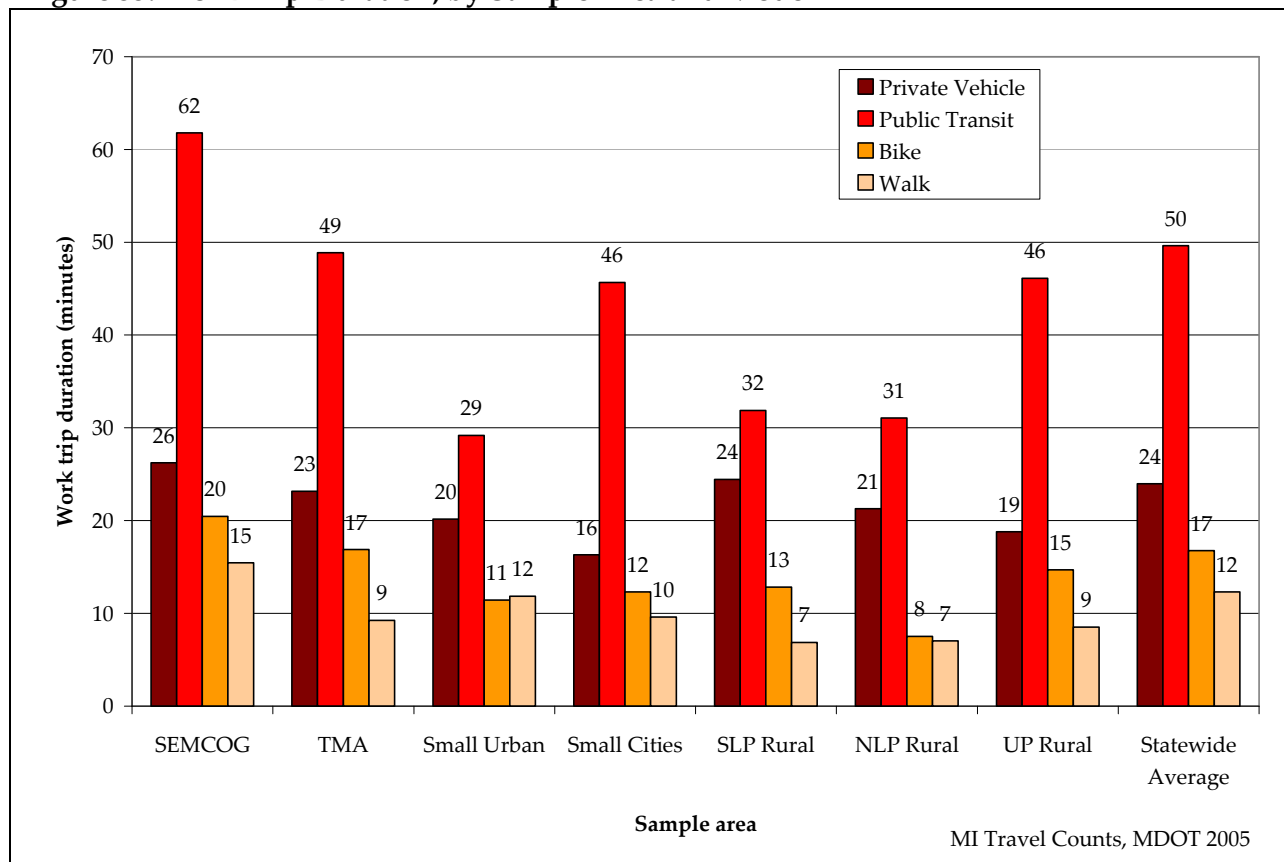
Statewide, modes that involve multiple stops, such as public transit and school buses, have longer travel durations than other modes (about 45 minutes and 27 minutes on average, respectively). Biking and walking have the shortest travel durations. The accessibility of cycling and walking, the lack of congestion on bicycle and pedestrian networks, and the short trip lengths for which cycling and walking are used all contribute to the shorter duration for these modes.

Work trip travel time is important because it affects mode choice and the feasibility of engaging in the workforce. It should be noted that the work trip duration is doubled when the mode is transit compared to private automobile (from the statewide average of 24 minutes to nearly 50 minutes). It is also notable that durations for work trips made by cycling and walking are less than auto trips, with durations of 12 and 16 minutes on average. The *Land Use Technical Report*

of the *MI Transportation Plan* further examines the spatial patterns of workplace and household locations that affect the viability of walk and cycling as modes to access work, and some commercial establishments.

Modes function differently under different conditions in different area types and regions of Michigan. Consequently, the duration of work trips by mode varies by area. **Figure 35** illustrates these differences. There is relatively little variability in the duration of work trips made by private vehicles, with the SEMCOG area having an average private vehicle work trip duration ten minutes longer than that of the Small Cities sample area, which has the lowest, at 16 minutes. Average transit work trip durations in Small Urban areas are less than half those found in SEMCOG. Issues affecting the connectivity, frequency, wait times, and operation of transit systems throughout the state are further discussed in the *Transit Technical Report* of the *MI Transportation Plan*.

**Figure 35. Work Trip Duration, by Sample Area and Mode**



### 3.3.4 Conclusion (How are People Traveling?)

This section has shown how the modal components of Michigan's transportation system connect users with activities. Travel in Michigan relies heavily on the private vehicle as the primary mode of transportation. Driving alone for all trip purposes predominates, but arranging high occupancy vehicle trips is a close second, partly because the pick-up/drop-

off/accompany purpose represents a high proportion of trips. Driving alone dominates the work trip purposes as the most common mode.

Transit and walking modes represent a small share of total trips; however, for households with income under \$20,000, the share of transit and walk modes are more significant. The same can be said about households without an automobile available and people without a driver's license.

Auto occupancy rates vary by purpose, reflecting the rates of high occupancy vehicle trips and driving alone discussed earlier. The lowest occupancy rate is for the work purpose, while social/recreation has the highest occupancy rate. Meanwhile, the small mode share for transit is partly explained by the average trip duration, which is at least twice that of using a private vehicle. Walking has the shortest average trip duration; however, the feasibility of walking and the distances involved in reaching destinations, particularly in rural areas, is prohibitive.

Differences in vehicle occupancy relative to trip purposes, the importance of arranging high occupancy vehicle trips for the non-driving population, the use of transit and walking as modes for those who do not drive, and the long duration of transit trips compared to other modes provide insight regarding overall trip duration by income category explored in **Section 3.1**. These and other issues raised in this section will be further explored in the following discussion of seasonal, weekly, and daily patterns of trip making throughout Michigan.

### 3.4 When People Travel in Michigan

Because the transportation system's ultimate function is to support user objectives by making connections to activities, it is important to understand these findings in light of the daily and seasonal cycles in which trips and activities occur. Issues such as the schedules of transit routes, the spreading of roadway traffic peaks, and the relative safety of travel on all modes are influenced by these cycles. Furthermore, the ability to access time-sensitive activities (such as the arrival of a commuter at work or access to a market during business hours) is critical to an integrated system supporting Michigan's overall economic vitality. This section offers insights into daily and seasonal traffic patterns and the manner in which Michigan's transportation system is used for activities.

#### 3.4.1 Permanent Traffic Recorder (PTR) Travel Patterns and Locations in Michigan

MDOT has an ongoing program designed to monitor traffic volumes on state trunkline using Permanent Traffic Recorders (PTR) located throughout the state. This traffic data is categorized into eight different patterns, which are influenced by the location and functional class of the road, as well as the surrounding land uses. These patterns provide insight into how travel varies by day of the week and month of the year around the state. The associated trunkline patterns in **Figure 36** and **Figure 37** demonstrate land use and in particular the road as a linkage to economic activities.

*Pattern 1.* Represents low seasonal variability typically found as routes between urban areas such as Grand Rapids, Kalamazoo, and Flint. This travel pattern has a low summer peak and a low winter dip.

*Pattern 2.* Represents high seasonal variability usually associated with rural areas throughout the state. A high number of these corridors are located in the southern half of the Lower Peninsula. This group shows a moderately low summer peak and moderate winter dip.

*Pattern 3.* Represents a low seasonal variability typically found in urban areas such as Lansing, Detroit, and Flint. This travel pattern has a flat summer with below average weekend traffic.

*Pattern 4.* Represents very high seasonal variability usually associated with recreational travel patterns (travel related to tourism and use of second homes). These patterns have high peaks on Friday and Sunday during the summer months and are located primarily in the Northern Lower Peninsula.

*Pattern 5.* Represents high seasonal variability with a high summer peak and sharp December decline. This serves as the major route for recreational travel through the Northern Lower Peninsula and the Upper Peninsula.

*Pattern 6.* Represents high seasonal variability with a moderate summer peak and can primarily be found in the Upper Peninsula.

*Pattern 7.* Represents a monthly variation that reflects the typical urban pattern, but drops very little on Saturday, as opposed to Pattern 3. This pattern is found on the fringes of urban areas.

*Pattern 8.* Represents very high seasonal variability usually associated with recreational patterns, with high summer peaks and low winter volumes.

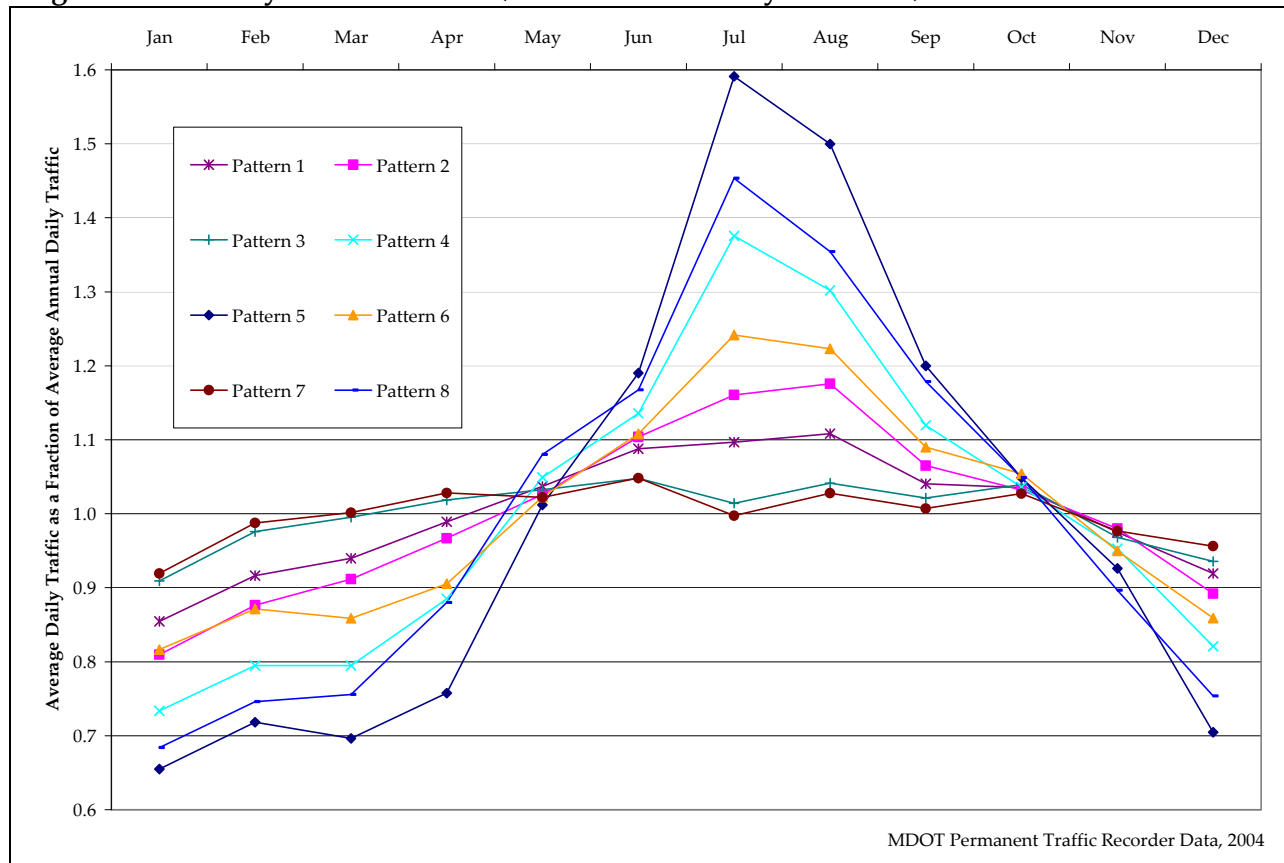
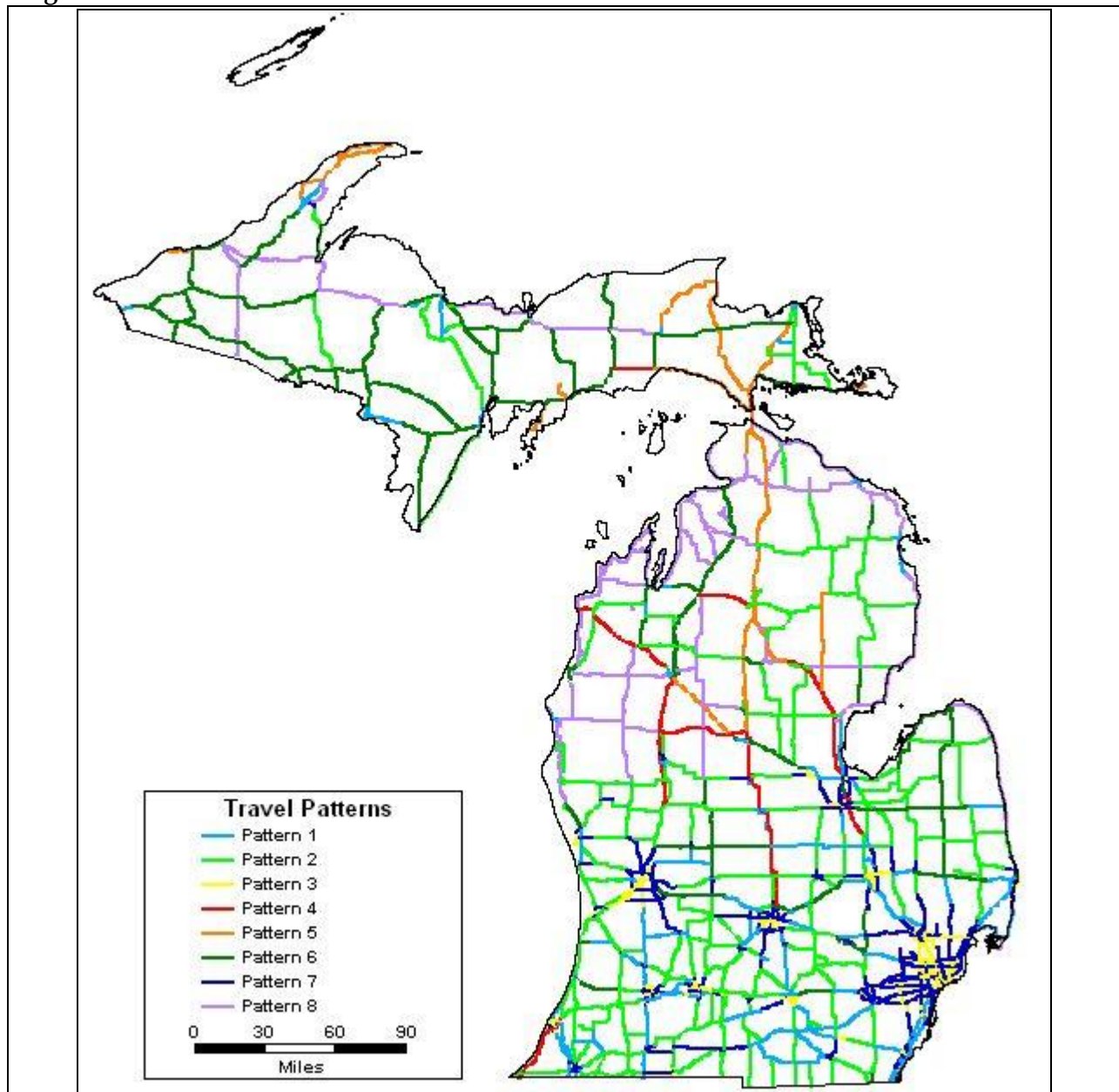
**Figure 36. Monthly Travel Patterns (Seasonal Variability in Traffic)**

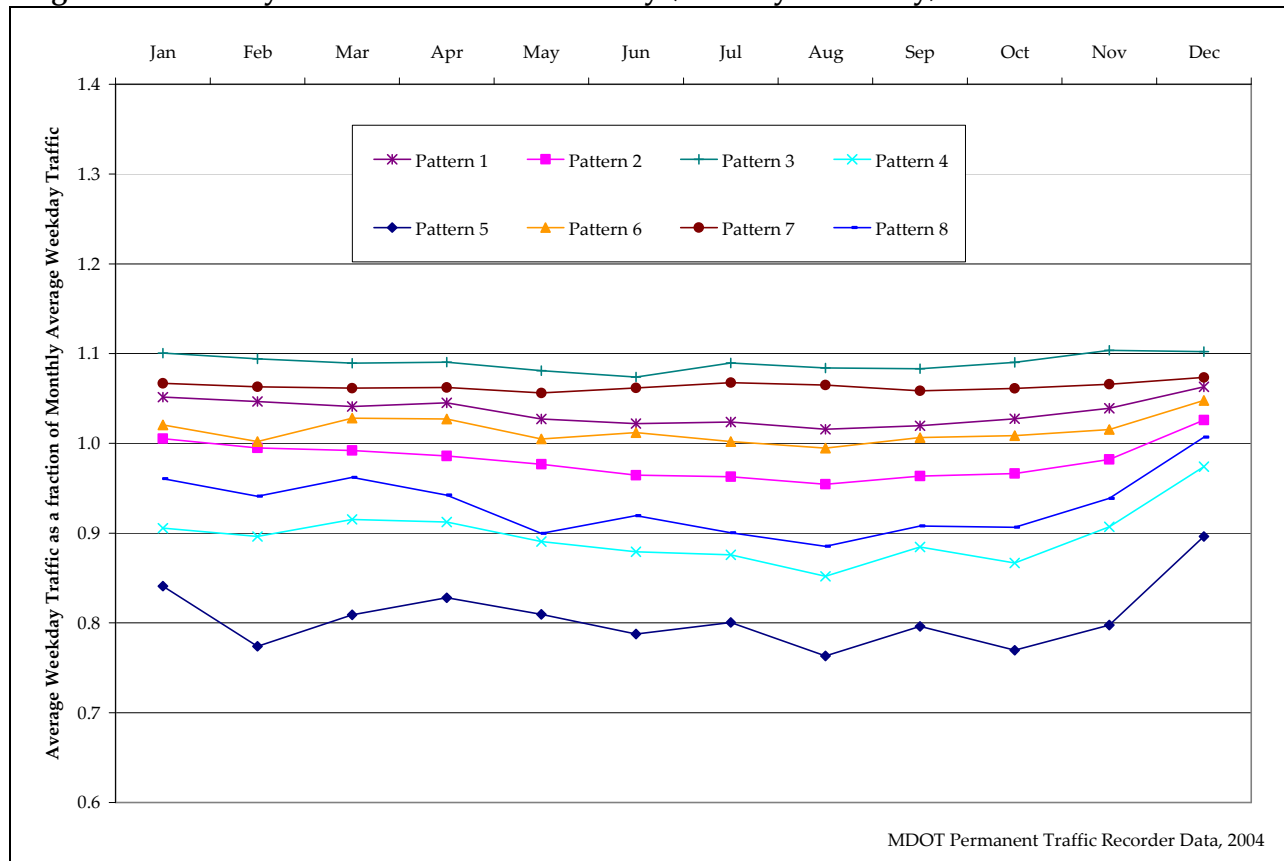
Figure 37. Travel Patterns on State Trunklines



### 3.4.2 Traffic Distribution by Month and Day of Week

The following graphs display how traffic volumes are distributed by month and by day of the week. For weekly travel, the volumes are fairly steady from Monday-Thursday but vary on the weekends. Fridays tend to carry the highest volumes across all eight travel patterns, but the weekends vary depending on the travel pattern. **Figure 38** through **Figure 41** show the monthly traffic variability for each pattern for the weekday (Monday-Thursday), Friday, Saturday, and Sunday.



**Figure 38. Monthly Traffic Pattern for Weekday (Monday-Thursday)**

As shown in **Figure 38**, monthly traffic patterns on weekdays in urban areas (Patterns 1, 3, and 7) and rural areas (Patterns 2 and 6) do not fluctuate as much compared to traffic patterns in rural/recreational areas (Patterns 4, 5, and 8). The rural/recreational patterns tend to have moderate decreases in traffic in February and May through October.

However, rural/recreational traffic patterns are significantly higher in the summer months during the weekend, as shown in **Figure 39** through **Figure 41**. The trends are most likely affected by the summer recreational season when people choose to travel more for vacations in locations that offer recreational opportunities. Rural/recreational travel is the inverse of both urban and rural travel; as rural/recreational travel increases, urban and rural travel decrease.

Figure 39. Monthly Traffic Pattern for Friday

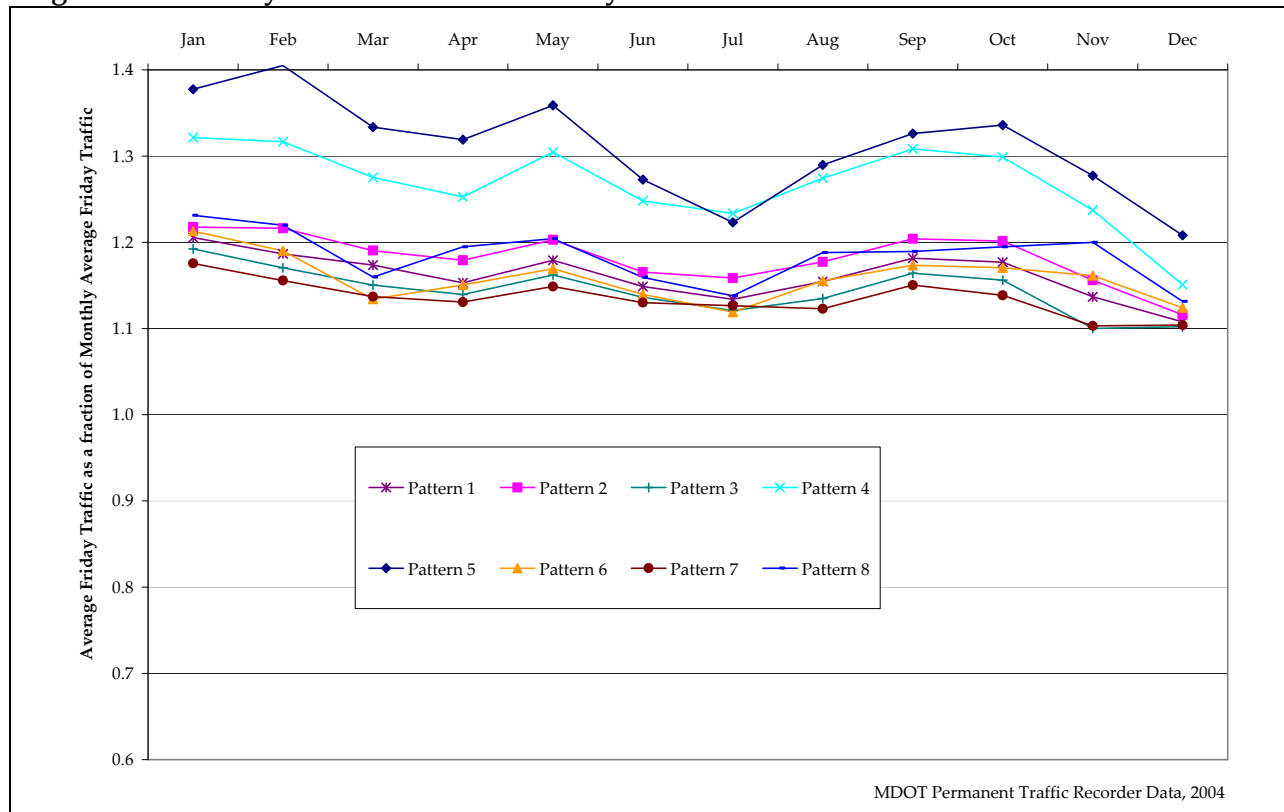
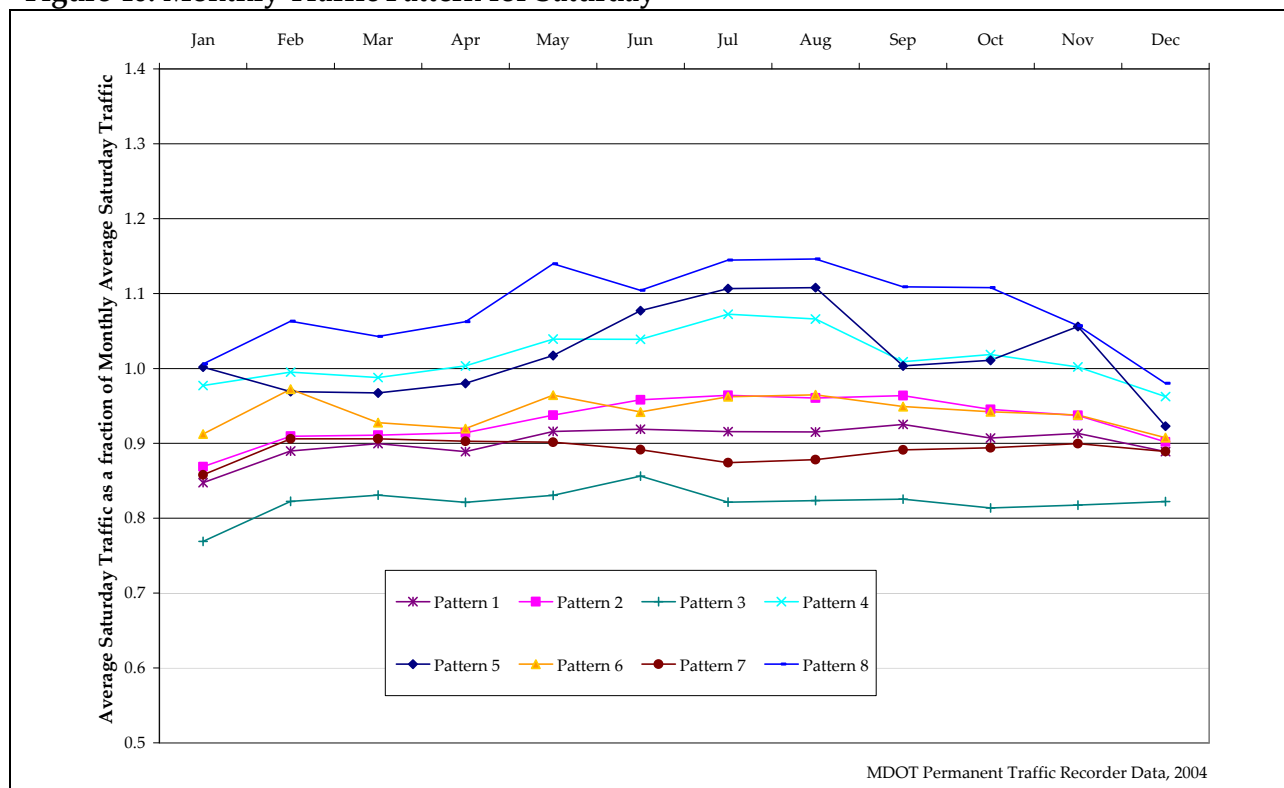
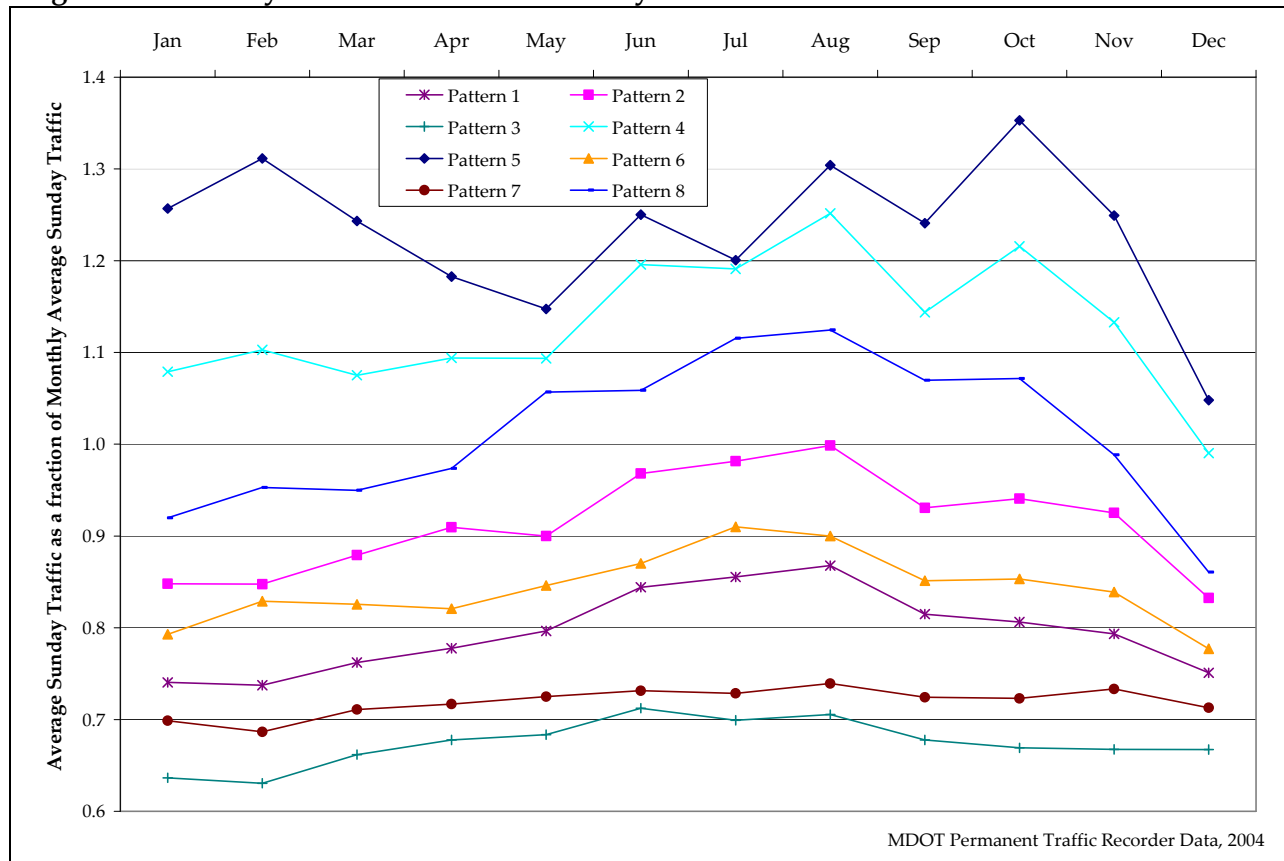


Figure 40. Monthly Traffic Pattern for Saturday



**Figure 41. Monthly Traffic Patterns for Sunday**

Seasonal travel patterns (variations in traffic volumes by month) reflect system utilization differently in different regions of Michigan. Rural/recreational patterns occur predominantly in the Northern Lower Peninsula and Upper Peninsula, where a high percentage of second homes and tourism-related employment are located.

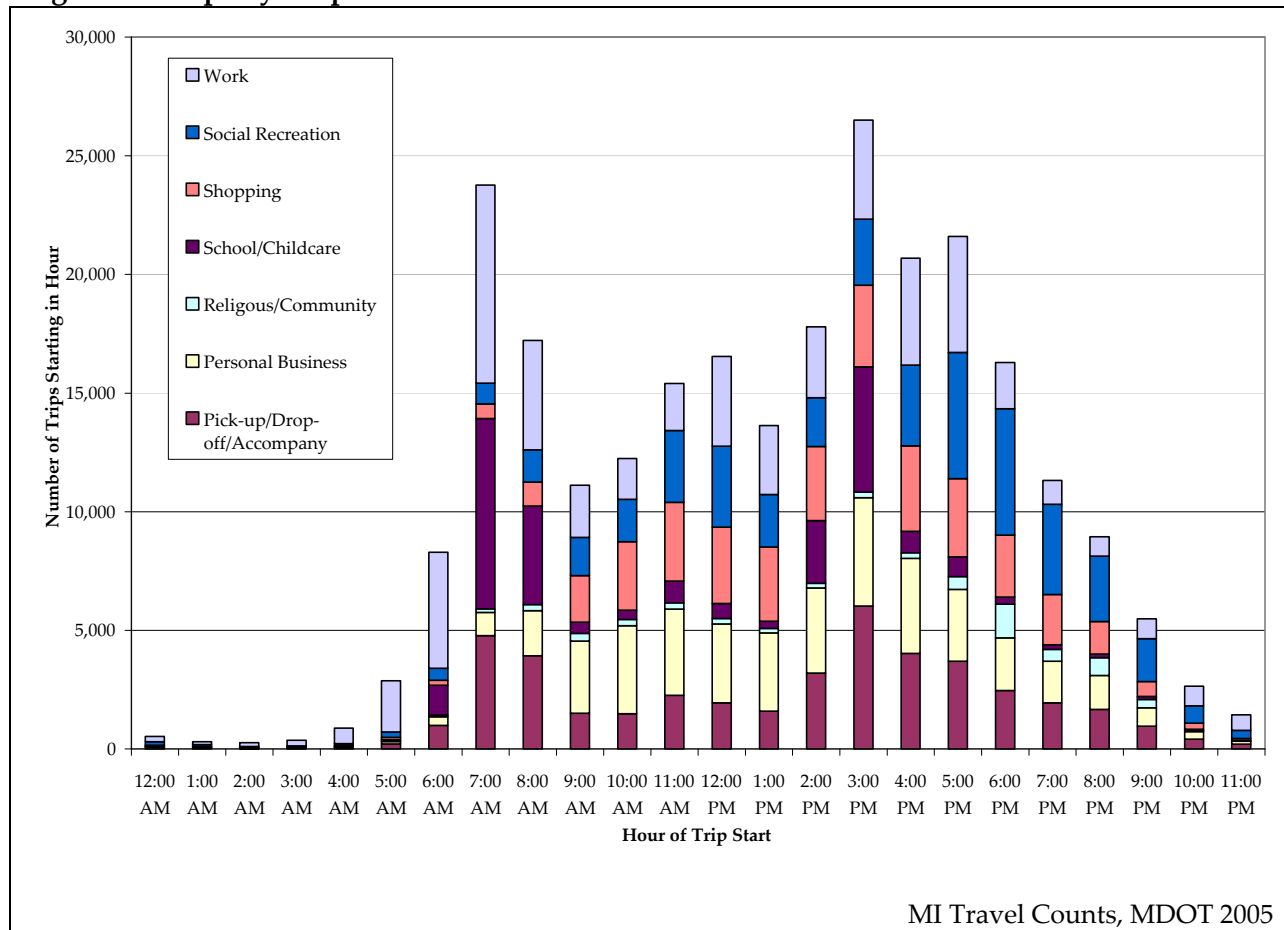
In the Southern Lower Peninsula, second homes comprise only two percent of the total homes. In the Northern Lower Peninsula and the Upper Peninsula, the percentages are 31 and 20 percent respectively (US Census Bureau). Meanwhile, tourism-related employment accounts for approximately eight percent of total employment in the Southern Lower Peninsula, where approximately four percent of the person days represent visitors. The Northern Lower Peninsula and the Upper Peninsula have significantly higher percentages, with approximately 11 and 10 percent tourism-related employment and 15 and 13 percent visitor person days, respectively (Michigan State University Extension).

### 3.4.3 Time of Day Travel

The departure times and purposes in this section are based on travel departure times reported in the MI Travel Counts data. The daily peak travel times in Michigan are for trips departing between 7:00 and 9:00 a.m. and between 3:00 and 6:00 p.m. The overall distribution of departure times throughout the day indicates more trip making in the afternoon than the morning for off-peak periods (6:00 p.m.-7:00 a.m. and 9:00 a.m.-3:00 p.m.), with evening trips (those with departure times after 6:00 p.m.) occurring with less frequency than late-morning or early-afternoon trips, but in greater frequency than early-morning trips (departing before 7:00 a.m.).

Work and school trips account for the largest variation in travel between peak and off-peak periods, and account for significantly larger shares of trips during peak periods than off-peak periods. Shopping and personal business trips account for proportionally more off-peak than peak trips, and social/recreational activities account for more trips in the evening peak and evening off-peak periods than other periods.

While work trips account for a significantly larger share of peak trips than off-peak trips, work trips occur throughout the day, and comprise a share of late-morning and early-afternoon travel comparable to the personal business, shopping, and social and recreational trips in these off-peak periods. Consequently, the issue of transportation system availability in off-peak periods (especially during the day and early evening) is important for both workforce and consumer market participation. This issue is further addressed in the *Transit Technical Report* of the *MI Transportation Plan*. **Figure 42** illustrates the travel peaks in Michigan and the respective shares of trip purposes by time of day.

**Figure 42. Trips by Purpose and Start Time**

### 3.4.4 Conclusion (When are People Traveling?)

This section has explored the seasonal, weekly, and daily patterns of trip making on Michigan's transportation system. Travel on trunklines peaks on Friday and late in the summer, highlighting the importance of recreational trip purposes throughout the state. Weekdays see little variation in travel throughout the year, especially in patterns that occur within or around urban areas. Work trips, along with pick-up/drop-off/accompany trips and school/childcare trips, are highly concentrated in the early morning and late afternoon/evening, contributing to the peak hour traffic, whereas shopping and personal business trips are spread more evenly throughout the day. Finally, as the number of retirees grows and work trips decline for the "baby boomers", the peak travel periods may begin to spread even more.

## 3.5 Long Distance Travel

### 3.5.1 Long Distance Travel by Person and Household Characteristics

For the purpose of this report, long distance trips are one-way trips over 100 miles made within a three-month period prior to the survey. It is important to note that long distance trips represent several trip purposes, including pleasure, business, personal business, school/church, and other activities. Because long distance trips place different demands on Michigan's transportation system (more system-miles traveled per trip, more demand for travel and hospitality services), the characteristics of this type of trip warrant a separate analysis. This section examines the nature of long distance trips in Michigan.

**Table 4** provides long distance trip rates for each of the seven sampling areas. It is expected that travelers in rural areas of the state make more long distance trips than those in urban areas. **Table 4** demonstrates that individuals in the Small Cities sample area and rural areas of the Northern Lower Peninsula and the Upper Peninsula make relatively more long distance trips per person than the statewide average. As expected, SEMCOG generates fewer of these trips per person.

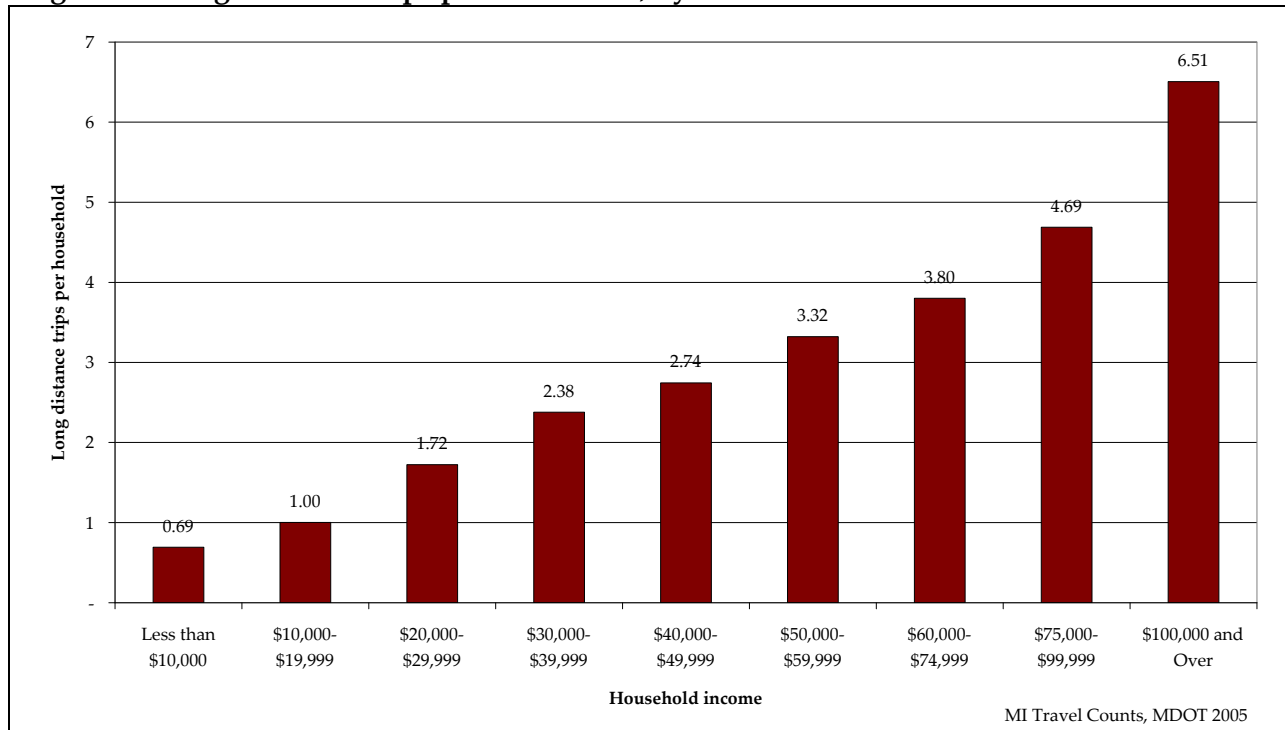
It is notable that men make these trips more than women. In the Upper Peninsula Rural sample area, however, women make slightly more long distance trips. The following analyses will further explore purposes and means/modes that account for these trips.

**Table 4. Long Distance Trips per Person, by Gender by Sampling Area**

	<i>SEMCOG</i>	<i>TMA's</i>	<i>Small Urban</i>	<i>Small Cities</i>	<i>SLP Rural</i>	<i>NLP Rural</i>	<i>UP Rural</i>	<i>Statewide Average</i>
All males	1.22	1.57	1.38	1.67	1.38	1.78	1.59	1.36
All females	1.04	1.22	1.23	1.52	1.08	1.53	1.61	1.15

Household income is a key determinant of long distance trip making as shown in **Figure 43**. With more workers and vehicles, it is expected that higher-income households will generate more trips of any type. Furthermore, the means to travel (both in terms of financial resources and auto availability) support an increased trip-making propensity for these households. Subsequent analysis in this report shows that recreational or pleasure trip purposes represent a large share of long distance trips, which are enabled by greater auto availability and higher household income.

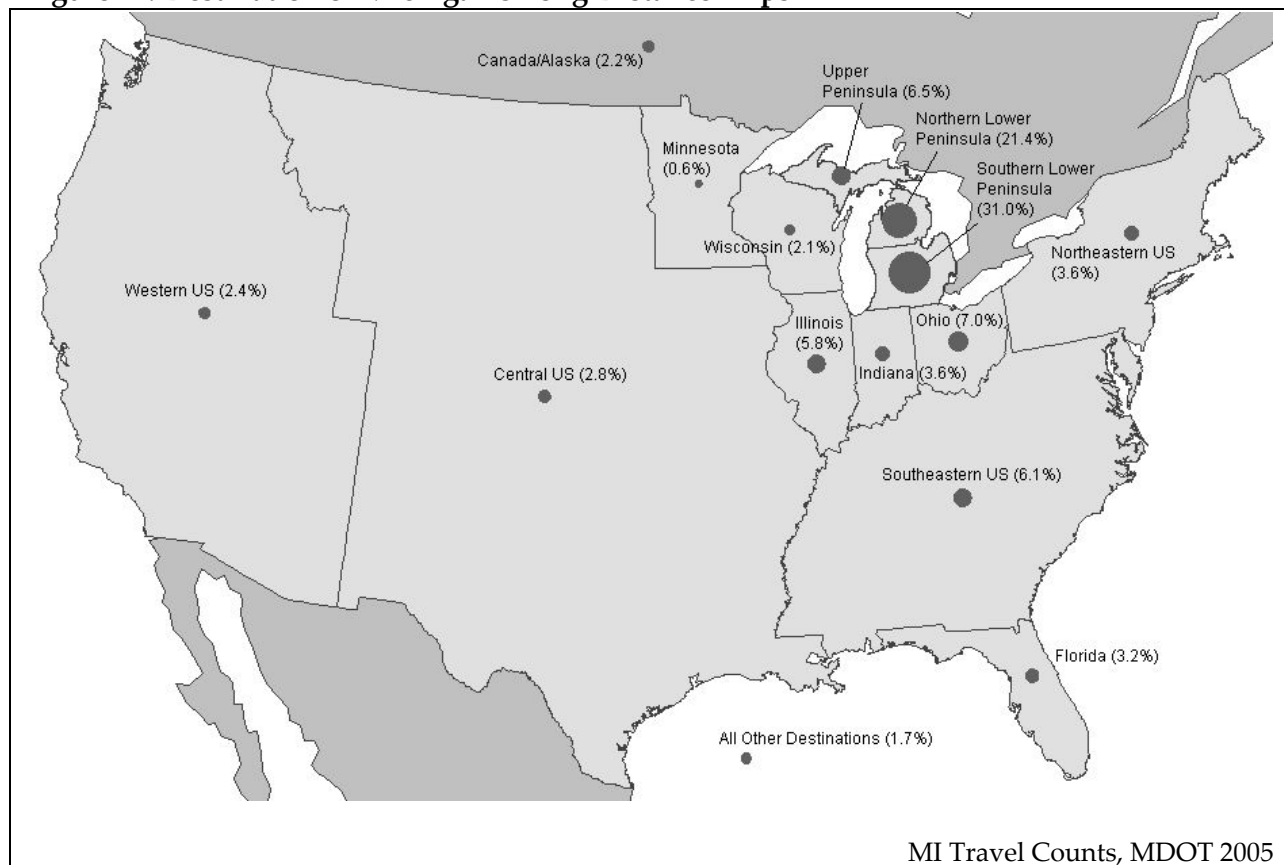
**Figure 43. Long Distance Trips per Household, by Household Income**



The most common destinations for long distance travel originating in Michigan are the Northern Lower Peninsula and Southern Lower Peninsula. Out-of-state travel destinations that are popular include Illinois and Ohio (see **Figure 44**). Florida attracts about three percent of Michigan's long distance travel, quite large considering its distance from the state.

The majority of long distance trips generated in Michigan (approximately 59 percent) are to within-state destinations. These destinations are roughly proportional to the density of employment and activity; the Southern Lower Peninsula accounts for the greatest share, followed by the Northern Lower Peninsula and the Upper Peninsula. **Figure 44** illustrates the relative frequency of destinations for long distance trips generated in Michigan.

**Figure 44. Destination of Michigan's Long Distance Trips**





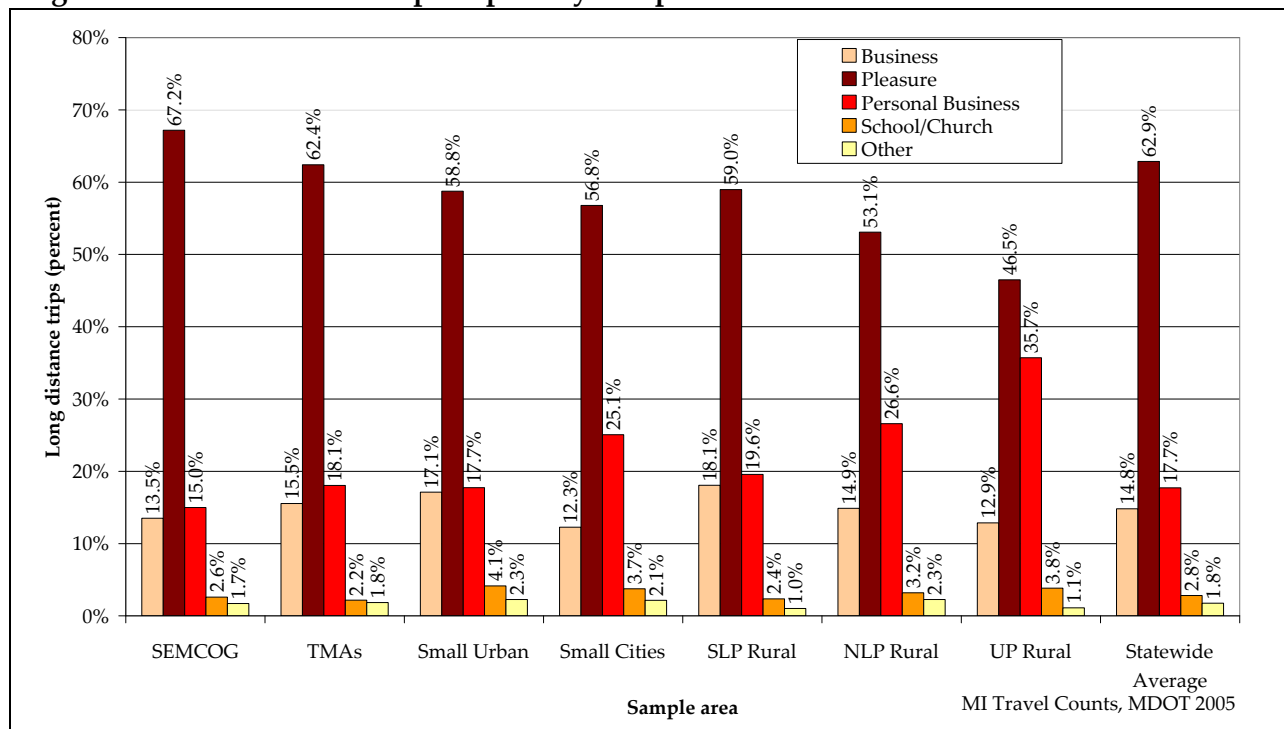
### 3.5.2 Long Distance Travel by Purpose

Statewide, nearly 66 percent of long distance trips are for pleasure. Personal business and business purposes represent 18 percent and 15 percent of long distance trips, respectively. The percentage of long distance trips for personal business is highest for the Upper Peninsula Rural sample area. **Figure 45** compares the distribution of trip purpose for different areas of Michigan.

A larger share of the long distance trips generated in the rural areas of the Upper Peninsula, the Northern Lower Peninsula, and Michigan's small cities are for personal business, as compared to the other sample areas. This indicates that the services available from trade centers within 100 miles of these locations lack amenities available in the SEMCOG area or in the cities of the Southern Lower Peninsula, requiring periodic long distance trips for personal business.

This pattern emphasizes the importance of transportation infrastructure and services facilitating access from these areas to trade centers more than 100 miles away. It also suggests that, if more personal business amenities were available locally, they may be utilized by local residents currently making long distance trips. The former issue is a critical demand on Michigan's transportation system serving these areas. The latter issue suggests demand on the system may be marginally reduced if such amenities are developed in these areas.

**Figure 45. Distribution of Trip Purpose by Sample Area**



Forty percent of Michigan's long distance trips are to destinations outside of the state. While **Figure 44** shows that destinations outside of the Great Lakes region account for a relatively small share of long distance trips, these trips are significant because they support a variety of activities important for Michigan's economic performance and quality of life.

In particular, while business trips account for just over 12 percent of long distance trips within Michigan, business accounts for a larger share of the trips to out-of-state destinations; 20 percent of long distance trips to other Great Lakes states are for business purposes. This indicates that access to other states is critical to support Michigan's business community. **Table 5** provides the percentage breakdown of long distance trip purposes for selected destinations.

**Table 5. Long Distance Trips, by Purpose by Destination**

<i>Destination</i>	<i>Business</i>	<i>Pleasure</i>	<i>Personal Business</i>	<i>School/ Church</i>	<i>Other</i>
Southern Lower	16.7%	56.6%	20.9%	4.2%	1.6%
Northern Lower	6.8%	76.1%	14.1%	1.3%	1.6%
Upper Peninsula	11.0%	64.4%	20.7%	2.6%	1.5%
<b>Michigan Average</b>	<b>12.2%</b>	<b>64.4%</b>	<b>18.8%</b>	<b>3.0%</b>	<b>1.6%</b>
Great Lakes States	20.0%	57.0%	17.9%	2.7%	2.3%
Florida	5.7%	81.0%	10.8%	0.8%	1.7%
Rest of Contiguous US	17.8%	62.9%	15.3%	2.3%	1.7%
Canada/Alaska	15.5%	67.2%	9.2%	4.9%	3.2%
Other	22.7%	66.2%	6.7%	3.6%	0.8%

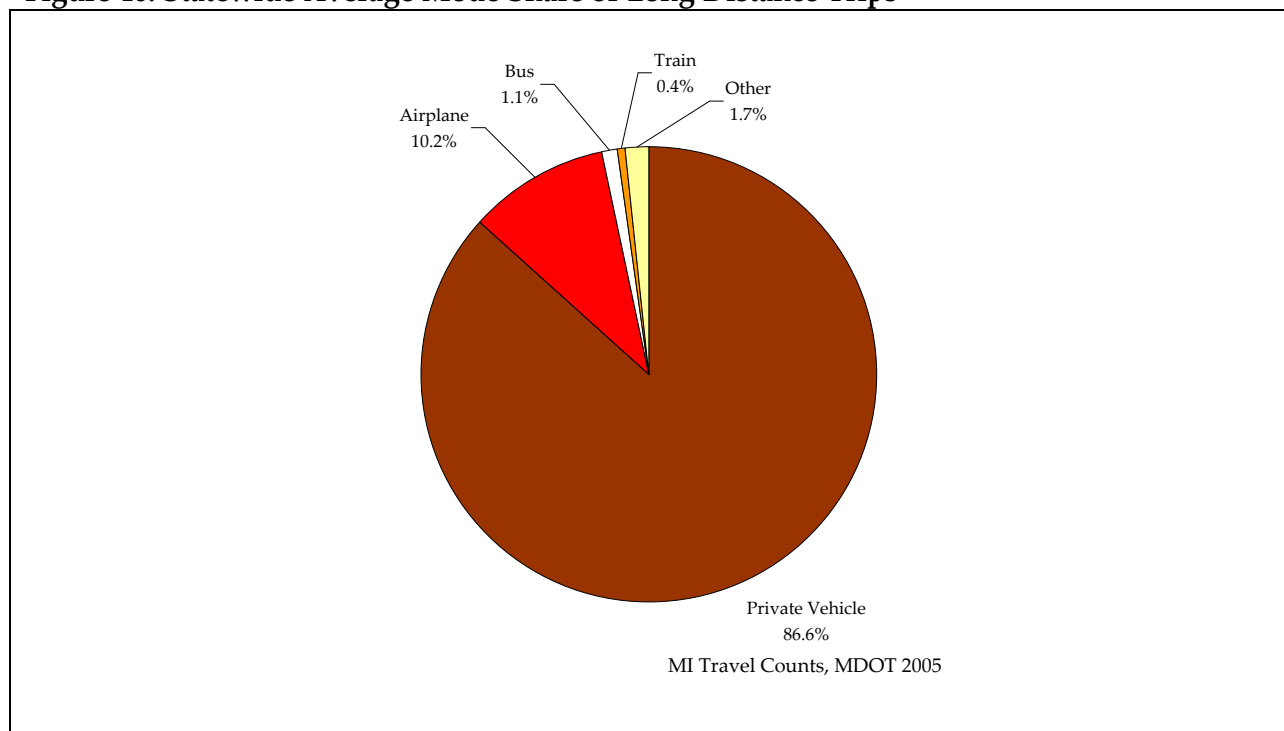
*MI Travel Counts, MDOT 2005*

### 3.5.3 Long Distance Trips by Mode

Statewide, over 86 percent of long distance trips are made in private vehicles. NLP Rural and UP Rural have the highest percentages of trips made in private vehicles. SEMCOG has the highest percentage of trips made by airplane, followed by the TMAs. These modal shares demonstrate the importance of passenger air travel for Michigan's long distance trips. Air travel accounts for more than ten percent of these trips statewide.

Air travel shares are comparatively low in small cities and rural areas. The demand for air travel is expected to be higher in SEMCOG and other urban areas because of larger concentrations of business air travel in large trade centers like Detroit. Furthermore, urban centers support a higher density of households in income brackets that can afford recreational air travel. Meanwhile, having limited direct and commuter flights in rural areas and small cities results in lower air travel utilization. **Figure 46** illustrates the statewide average modal shares for long distance trips.

**Figure 46. Statewide Average Mode Share of Long Distance Trips**



Naturally, the percentage of trips made by private vehicle decreases as the distance to the destination increases (see **Table 6**). Approximately 97 percent of long distance travel within Michigan is done by private vehicles. This percentage decreases to an average of 91.7 percent for the other Great Lakes States and 56.8 percent for the rest of the contiguous United States.

Airplanes are more commonly chosen for destinations in the Western United States and Florida (76.8 percent and 53.4 percent, respectively). At least 85 percent of the long distance travel to all other locations (outside the US and Canada) was via airplane. Illinois has the highest percentage of long distance trips made by train (4.4 percent). This is linked to the existing train service available for trips to Chicago.

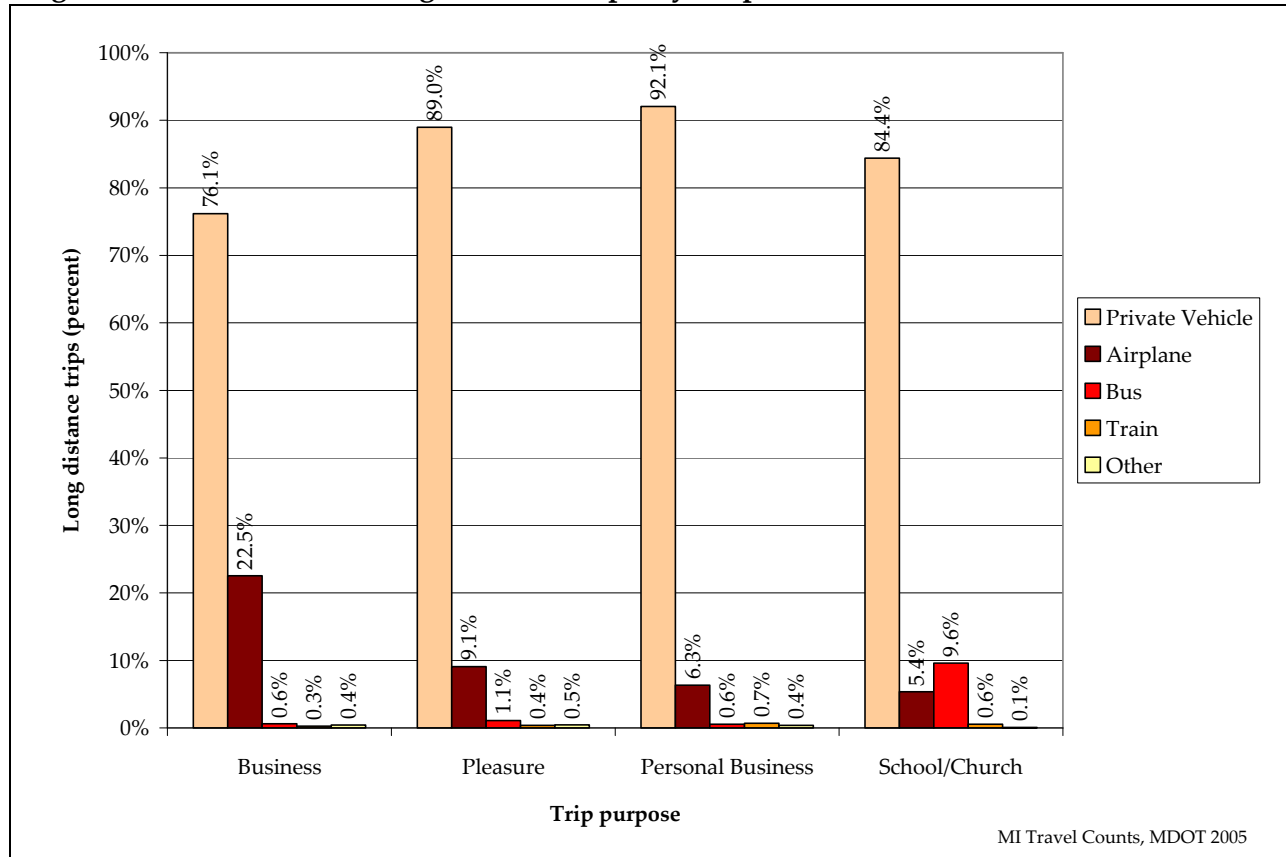
**Table 6. Mode Share of Long Distance Trips from Michigan, by Destination**

<i>Destination</i>	<i>Private Vehicle</i>	<i>Airplane</i>	<i>Bus</i>	<i>Train</i>	<i>Other</i>
Southern Lower	96.3%	1.2%	0.9%	0.0%	1.5%
Northern Lower	97.4%	0.8%	0.8%	0.0%	1.1%
Upper Peninsula	94.6%	1.0%	2.4%	0.0%	2.1%
<b>Michigan Average</b>	<b>96.6%</b>	<b>1.0%</b>	<b>1.0%</b>	<b>0.0%</b>	<b>1.4%</b>
Ohio	93.3%	1.9%	1.2%	0.1%	3.5%
Indiana	95.0%	3.1%	0.6%	0.0%	1.3%
Illinois	87.6%	4.3%	1.6%	4.4%	2.1%
Wisconsin	87.4%	10.3%	0.5%	0.0%	1.8%
Minnesota	71.8%	25.5%	1.8%	0.0%	0.9%
<b>Great Lakes Average</b>	<b>91.7%</b>	<b>3.6%</b>	<b>1.2%</b>	<b>1.4%</b>	<b>2.2%</b>
Florida	44.2%	53.4%	0.6%	0.1%	1.8%
Northeastern US	66.7%	29.0%	1.7%	0.7%	1.9%
Southeastern US	72.3%	24.0%	2.3%	0.3%	1.1%
Central US	55.4%	40.5%	0.4%	0.8%	2.9%
Western US	19.4%	76.8%	0.4%	1.0%	2.4%
<b>Rest of Cont. US Avg.</b>	<b>56.8%</b>	<b>39.6%</b>	<b>1.3%</b>	<b>0.5%</b>	<b>1.8%</b>
Canada/Alaska	87.5%	8.1%	1.4%	1.2%	1.8%
Other	8.7%	85.2%	1.1%	0.6%	4.3%

*MI Travel Counts, MDOT 2005*

Overall, private vehicles are the dominant mode for long distance trips (**Figure 47**). Business trips have the highest percentage by airplane (22.5 percent). Personal business trips have the highest percentage by private vehicle (92.1 percent), and school/church trips have the highest percentage by bus (9.6 percent).

**Figure 47. Mode Share of Long Distance Trips, by Purpose**



The percentage of long distance travel via private vehicles is fairly constant across household incomes except at the two extremes; it is lower for households with incomes less than \$10,000 and for households with income over \$100,000. This is due to the higher utilization of the bus mode for very low-income households and the airplane mode for very high-income households (above \$60,000 income the percentage of trips by airplane increases), as seen in **Table 7**. The percentage of trips by bus is significantly higher for the lowest two income groups.

It should be noted that the lowest income brackets have been found elsewhere in this report to account for a large share of zero-auto households; hence, it is expected that non-auto modes for this group account for a larger share of long distance trips than is the case for middle income brackets.

**Table 7. Mode Share of Long Distance Trips from Michigan, by Household Income**

	<10K	10-20K	20-30K	30-40K	40-50K	50-60K	60-75K	75-100K	100K+
Private Vehicle	85.2%	89.3%	89.7%	90.5%	87.4%	89.9%	86.9%	87.2%	82.0%
Airplane	7.3%	5.3%	6.6%	6.0%	8.1%	7.5%	9.9%	10.3%	15.3%
Bus	5.9%	4.0%	1.9%	1.3%	2.0%	0.9%	1.1%	0.6%	0.7%
Train	1.3%	0.6%	0.8%	0.6%	0.5%	0.3%	0.3%	0.3%	0.4%
Other	0.3%	0.8%	1.0%	1.5%	2.0%	1.3%	1.9%	1.5%	1.6%

*MI Travel Counts, MDOT 2005*

### 3.5.4 Conclusion (Long Distance Travel)

Long distance travel is important for Michigan's economy. According to the *Michigan Tourism Facts*, "almost 60 percent of Michigan's visitor person days originates within Michigan." Illinois is a distant second at just over seven percent. The most common purpose for long distance travel is pleasure, followed by personal business. Personal business is especially high in the rural areas, where some services are not as readily available.

The private automobile remains the primary mode of travel for all long distance trips regardless of the purpose, especially for travel within the state. For out-of-state trips, business purposes factor more prominently as does air transportation as a mode of travel. This section has explored how, why, and where long distance trips occur. The following chapter highlights the importance of the findings of this report in creating an integrated *MI Transportation Plan*.

## Chapter 4. Integration

This *Travel Characteristics Technical Report* will support the *MI Transportation Plan* by identifying linkages between the key user segments and activities that require the utilization of Michigan's transportation system. User segments and activities are viewed in the *MI Transportation Plan* within the context of available modal systems, and the performance of each component of Michigan's transportation system. This section highlights those user groups (segments) and activities observed in the *Travel Characteristics Technical Report*. It also explores how the travel characteristics are relevant to identifying and addressing transportation system catalysts and barriers to economic vitality within the larger policy context of the *MI Transportation Plan*. The travel characteristics discussed in this technical report are essential for the integrated *MI Transportation Plan*. The understanding of activities in Michigan requiring travel by various modes, and the issues experienced by different segments of the population in utilizing the current system, are important for understanding future trends.

### 4.1 Segments and Activities

**Chapter 3** of this report describes in detail the segments of travelers using Michigan's transportation system. The report provides information pertinent to the anticipated changes in Michigan's population and the unique objectives of user segments as described in the other technical reports of the *MI Transportation Plan*. An integrated transportation system requires an appropriate mix of modal options and institutional arrangements to ensure access by these segments to activities important for participation in Michigan's economy.

#### 4.1.1 Workers

As indicated in **Table 3**, the journey to work is the dominant trip purpose for men and women ages 21-64. While the majority of work trips in all areas of the state are made by workers driving alone or arranging high occupancy vehicle trips, other modes (such as walking or bicycling) account for marginal shares of work trips, especially in small cities and rural areas. Transit accounts for a greater share of commuting in SEMCOG and the TMAs than in other parts of the state.

The system utilization for work trips is important for an integrated transportation system to support Michigan's economy. The workforce in Michigan is highly dependent on private vehicles in all areas of the state. This dependency and lack of transit may have led to less than desirable access for some segments of population to maintain participation in the workforce. Even for people without their own vehicles, private vehicles remain the most common mode to work. However, as indicated in the above paragraph, walking (especially in small cities) is an important mode, the safety and accessibility of which is important for commuters in some areas. The importance of modes other than driving, especially in small cities (where other modes comprise more than five percent of work trips), indicates that further incorporation of bicycle, walking, and other non-motorized alternatives may improve participation in the workforce in these areas.

### 4.1.2 Students and Young People

Travel to educational activities is the dominant purpose for travelers under the age of 20 (see **Table 1**). Throughout the state, school bus systems play a vital role in enabling children and young people to access educational opportunities. In most areas, walking is also a very important component of the journey to school (or other educational activities). Safe non-motorized routes to school and school bus stops very important to support education in Michigan. Consequently, an integrated *MI Transportation Plan* should emphasize the importance that road and pedestrian infrastructure will contribute to safe routes to schools.

For purposes other than educational activities, young people comprise a significant share of travelers without access to their own cars. Walking and public transit are noted as critical modes for this group; hence, pedestrian and transit alternatives provide an opportunity to participate in these activities. The *Safety Technical Report* indicates that younger drivers are also at higher crash risk (especially at night), further indicating that safe walking and transit alternatives for young people to non-school activities is an important consideration for an integrated transportation plan.

### 4.1.3 Older Population

**Figure 9** of this report indicates that as citizens reach retirement age, trip making declines, but by less than two trips per day. This suggests that non-work trip purposes (perhaps occurring during off-peak hours) partially offset reductions in the journey to work as a travel aim for this growing segment of the population. **Figure 12** shows that, overall, travelers make shorter trips after reaching retirement age. Furthermore, the findings in **Table 13** indicate that senior segments of Michigan's travelers make more trips for shopping, personal business, and social and recreational activities than younger cohorts.

Ease of travel allows significant participation of retirement-aged persons in consumer markets. Therefore, it is especially important to maintain safe and accessible alternatives for this group for the retail and service sectors of Michigan's economy. Mode share for this age cohort is still predominantly by private vehicle but options for those with safety or mobility issues should be researched. The *Transit Technical Report*, the *Socioeconomics Technical Report*, and the *Safety Technical Report* describe some of the challenges and alternatives associated with this segment given today's system. These reports should be read in light of the purposes, frequency, and duration of older travelers' trips as described in this report. Together, these technical reports should be the basis for an integrated system meeting the requirements of this growing segment.

### 4.1.4 Women and Families

Throughout this technical report, it has been found that women aged 21-64 travel differently in terms of trip purposes than men, with shorter travel durations and more non-work activities. Access to these activities is important for Michigan's consumer markets. Moreover, the relatively large number of pick-up/drop-off/accompany trips made by women in these age cohorts suggests the importance of providing transportation to children, elderly, and others without access to vehicles and driver's licenses.



#### 4.1.5 Non-Driving Populations

Households without access to vehicles and individuals without driver's licenses have to rely on alternative transportation other than driving for participating in Michigan's workforce and consumer markets. This report has highlighted the importance of high occupancy vehicle trips as well as transit and walking for these individuals. This group includes other segments of the population (children and young people as well as the elderly and those in low-income households). Increasing choices and travel options for this group, especially in areas without fixed-route transit, is an important issue in the *MI Transportation Plan*.

#### 4.1.6 Recreational Long Distance Travelers

**Figure 45** and **Figure 46** summarize relevant findings regarding travelers making long distance trips. The finding that long distance trips predominantly support recreational (pleasure) activities indicates that these trips facilitate participation in Michigan's recreational service and (to some extent) hospitality-related markets. **Figure 47** indicates that long distance trips are overwhelmingly made by private vehicles.

Consequently, ensuring safe access to recreational activities and destinations for long distance auto trips is important for Michigan's recreational service sectors. Limitations such as safety risk, congestion, or degradation of the environmental quality of recreational destinations across the state may jeopardize this important activity. The integrated *MI Transportation Plan* must take into account the importance of safe access to key recreational activity destinations to secure participation of this important traveler segment in recreational markets. While not explicitly addressed in this report, the sensitivity of recreational long-distance travelers to the availability of non-auto long distance travel alternatives may limit the number of long distance recreational trips.

#### 4.1.7 Personal Business Long Distance Travelers

Eighteen percent of long distance travelers travel for "personal business." This finding indicates that in rural areas of Michigan, certain amenities required for periodic personal needs are located more than 100 miles away. Ensuring safe access from small and medium sized communities to the larger communities and regional trade centers is especially important to support the participation of this segment in the various markets represented by personal business—which could include health care, highly skilled services, and educational services (such as trips to a college), as well as specialized products not available in more remote areas. The transportation system plays a key economic role in linking Michigan travelers to these amenities.

## 4.2 Opportunities and Performance Barriers

“Performance barriers” are conditions on the transportation system that make it more difficult, more expensive or impossible for an activity to take place. In the economic impact element of the *MI Transportation Plan*, performance barriers are represented as “costs of doing business;” however they also include barriers to households and individuals. In the *Conditions and Performance Technical Report* of the *MI Transportation Plan*, performance barriers are captured by performance measures. “Opportunities” are conditions on the transportation system that make it easier, less expensive or possible for an activity to take place that may not otherwise occur. In the economic impact element of the *MI Transportation Plan*, opportunities are represented as “amenities;” however they also include opportunities for households or individuals in addition to businesses. For the purposes of this report, opportunities are understood as special ways in which system performance may stimulate users to engage in more or better activities.

Barriers to travel on Michigan’s transportation system can inhibit segments of the population from participating in Michigan’s workforce or consumer markets. These barriers may be considered “performance barriers” to economic activity. The travel characteristics of each segment provide some indication of how opportunities and performance barriers on modes, and between modes, may support or hinder participation in Michigan’s economic activity. In the same way, the travel characteristics reported above offer insights as to how improvements in the system may enhance market or workforce participation in ways that support the overall economic vitality of the state.

The specific transportation system opportunities and performance barriers to economic activity rest in the performance of the highway, transit, freight, and other systems described in other reports. This report does not explore particular opportunities and performance barriers, but rather provides the rationale for opportunities and performance barriers on and between modes referenced in other technical reports of the *MI Transportation Plan*.

## 4.3 Integrating Travel Characteristics

Both this *Travel Characteristics Technical Report* and the associated MI Travel Counts data (2005) are key references for integrating travel characteristics into the *MI Transportation Plan*. The current report has addressed the issues of: (1) who travels in Michigan; (2) why people travel in Michigan; (3) how people travel in Michigan; and (4) when people travel in Michigan. The answers provided in this technical report enable the complementary technical reports to address other issues such as: (1) what conditions hinder this travel; (2) how enhanced performance might support the efficiency, safety, and sustainability of this travel; and ultimately (3) how improved transportation can play an optimal role in Michigan’s economic vitality.

This *Travel Characteristics Technical Report*, the *Socioeconomics Technical Report*, the *Economic Outlook*, and the *Freight Technical Report* are the elements of the *MI Transportation Plan* setting forth the user objectives supported by Michigan’s transportation system in the long term. The

other technical reports focus more on the assets, services, and systems available and improvement associated with meeting user objectives through the year 2030.

The condition of Michigan's overall transportation system and its performance are understood to support the travel segments and participation in economic activities outlined in these four technical reports. Consequently, this technical report provides source material for technical reports that more explicitly address the individual system components, such as the *Conditions and Performance Technical Report* and the *Integration Technical Report*. These reports will bridge the facets of each system component into an integrated understanding of the system's overall condition, performance, and requirements for meeting the user objectives of Michigan's residents.

## Chapter 5. Conclusion

The following high-level observations will help the development of policy, goals, objectives, and the preferred vision for the *MI Transportation Plan*. Household and personal characteristics influence average trip rates, trip purpose, and trip durations. The general characteristics presented can be used to determine the travel behaviors of Michigan residents and anticipate their needs to provide a transportation system that benefits all.

### 5.1.1 Who is Traveling in Michigan and How Often?

Trip rates are found to be greatly influenced by household size; larger households have more trips overall. Single-occupant households average 3.3 trips per day, while households with four or more occupants average 16 trips. Households average roughly three more trips for each additional person. Average trips per household also increase with each additional automobile available; the greatest increase occurs between one- and two-auto households (4.7 trips). A third auto in the household increases the trip rate by only 1.3 trips. Findings also show that low-income households (under \$20,000) had the lowest average trip rates, but the highest average trip duration.

All sample areas show the same pattern of higher trip rates with increases in household size, income, or autos. However, of the seven sample areas, Small Cities have the highest overall household trip rate of 9.33. Small Cities provide urban amenities (unlike the three rural areas, whose trip rates range from 7.75 to 8.54) without the traffic congestion of the more urbanized SEMCOG and TMA sample areas.

Trip rates and duration also vary significantly in relation to personal characteristics such as gender, age, and working status. Women, in general, make more trips than men before the age of 65, while men make an average of 0.48 more trips than women after the age of 65. Women ages 36-64 have the highest trip rate of 4.10. Trip rates increase with age for both genders, peaking for the age group of 36-64, then decreasing significantly. Travel duration is also found to be different based on personal characteristics. On average, men make longer trips than women for all age cohorts. The longest trips overall are for men between the ages of 21 and 35, at 21.9 minutes per trip.

Working status also affects person trip rates. Workers make more trips per day (3.94) than non-workers (2.89); however, non-workers (including persons under the age of 15) make 43 percent of Michigan's overall trips. Part-time workers make more daily trips (4.36) than full-time workers (3.94), by either making more non-work trips or multiple work trips. With an aging population and phased retirement, there may be more part-time workers in the future, which may have a significant impact on future travel.

While not every household or person conforms to the average travel characteristics for their particular grouping, the figures presented here give an overall view that travel is very different based on household size, income, gender, age, and working status.

### 5.1.2 Why are People Traveling?

The average person in Michigan makes 3.46 daily trips. Of this average, 1.75 trips per day are for shopping, personal, or recreational travel, compared to about 0.76 trips per day for work purposes. School and religious or community-related trips account for a smaller share of average daily trips. There is a gender difference in the distribution of trip purposes, 27.2 percent of men's trips are for work as compared to 17.7 percent of women's. Pick-up/drop-off/accompany trips take up the largest percentage of women's trips, accounting for 20.5 percent.

There is also a gender difference in the distribution of trip purposes; 27.2 percent of men's trips are for work as compared to 17.7 percent of women's. Pick-up/drop-off/accompany trips take up the largest percentage of women's trips, accounting for 20.5 percent. For the age group 21-64, women make more than twice as many pick-up/drop-off/accompany trips as men.

The three most common daily trip patterns are the same for both genders; however, the percentage for each pattern varies significantly between the genders. While the most common daily trip pattern for men is home-work-home at 13.5 percent, for women the home-other-home pattern is predominant (8.4%).

The various segments of Michigan's population travel for diverse reasons. While all people make trips for all purposes, the distribution of those purposes is significantly influenced by gender, age, and working status.

### 5.1.3 How are People Traveling?

Travel in Michigan relies heavily on the private vehicle as the primary mode of transportation for 89.9 percent of all trips. Driving alone predominates for all trip purposes, but high-occupancy vehicle trips are a close second at 41 percent of all trips, partly because the pick-up/drop-off/accompany purpose represents a high proportion of trips.

Transit (1.2%) and walking (4.0%) modes represent a small share of total trips. However, for households with income under \$20,000, the share of transit and walk modes are more significant. The same can be said about households without an automobile available and people without a driver's license. Persons with no direct access to vehicles use transit for 17.3 percent of their trips and walk for 22.9 percent. Nevertheless, the mode that predominates for the non-driving population is still the private vehicle. Persons over the age of 15 without a driver's license rely on private vehicles for 66.0 percent of their trips.

The small mode share for transit is partly explained by the average transit trip duration of 44.6 minutes, which is at least twice that of using a private vehicle. Walking has the shortest average trip duration of 13.3 minutes; however, the feasibility of walking and the distances involved in reaching destinations, particularly in rural areas, can be prohibitive. Auto occupancy rates also vary by trip purpose. The lowest occupancy rate is for the work purpose at 1.08 persons per vehicle, since driving alone is by far the dominant mode of choice for work trips in Michigan. People tend to share rides more for trip purposes other than work. Social/recreation trips have the highest occupancy rate at 1.52 persons per vehicle.

While travel in Michigan is predominantly by private vehicle for all segments of the population, there are some discernable differences in mode choices, which are mostly determined by household income, vehicle availability, and having a driver's license. As a result, these household and personal characteristics will help identify the groups that are most likely to utilize or be in need of transportation alternatives.

#### *5.1.4 When are People Traveling?*

Michigan is a state that has definitive seasonal changes, which are reflected in when the most travel occurs in the state. Distinct travel patterns are also evident by day of the week and hour of the day. Friday is the busiest travel day in Michigan, and late summer is the season in which the most trips for all purposes occur. The travel increases on Fridays along trunklines highlight the importance of recreational trip purposes throughout the state. Weekdays see little variation in travel throughout the year, especially within or around urban areas.

Weekday travel peaks for trips departing between 7:00 and 9:00 a.m. and between 3:00 and 6:00 p.m. Work and school trips account for the largest variation in travel between peak and off-peak periods. Meanwhile, shopping and personal business trips occur more evenly throughout the day, rather than at distinct peak periods. As the number of retirees grows and work trips decline for the "baby boomers", the peak travel periods may begin to spread even more.

#### *5.1.5 Long Distance Travel*

Long distance travel is important for Michigan's economy, as more than half of the long distance trips generated in Michigan stay within the state (58.9%). The most common purpose for long distance travel is pleasure at 62.9 percent, followed by personal business at 17.7 percent. Personal business is especially high in the rural areas (35.7% in the Upper Peninsula Rural area), where some services are not as readily available (such as medical facilities). Business trips make up a larger share of out-of-state than in-state long distance trips.

The private automobile remains the primary mode of travel for all long distance trips, at 86.6 percent. Air transportation accounts for a larger share of long distance business trips than for other purposes. Air also accounts for a larger share of SEMCOG's long distance trips than the other sample areas, due to the presence of a major airport.

Long distance travelers are an important segment of Michigan's transportation system users. The state's economic vitality relies on people traveling in Michigan to enjoy the recreational and other amenities the state has to offer.





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